

AMERICAN UNIVERSITY OF BEIRUT

STUDYING THE PROGRESSION OF CONSTRUCTION CLAIMS
UNDER DIFFERENT STANDARD CONTRACT CONDITIONS:
COMPARISON, ASSESSMENT, AND MODELING

by
MOHAMMAD OMAR BARAKAT

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MOHAMMAD OMAR BARAKAT

Approved by:

Dr. Mohamed-Asem Abdul-Malak, Professor
Civil and Environmental Engineering Department



Co-Advisor

Dr. Hiam Khoury, Associate Professor
Civil and Environmental Engineering Department



Co-Advisor

Dr. Mutasem Fadel, Professor
Civil and Environmental Engineering Department



Committee Chair

Dr. Farook Hamzeh, Assistant Professor
Civil and Environmental Engineering Department



Member of Committee

Dr. Carol Menassa, Associate Professor
Civil and Environmental Engineering Department
University of Michigan



Member of Committee

Dr. Rita Awwad, Associate Professor
Civil and Environmental Engineering Department
Lebanese American University



Member of Committee

Date of dissertation defense: [October 11, 2018]

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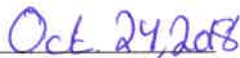
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AN ABSTRACT OF THE DISSERTATION OF

Mohammad Omar Barakat for Doctor of Philosophy
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Title: Studying the Progression of Construction Claims Under Different Standard Contract Conditions: Comparison, Assessment, and Modeling

As claims have become inevitable throughout the course of construction projects, claim/dispute administration mechanisms have gained considerable attention in the last years. These are offered by several standard contract conditions, including those drafted by the American Institute of Architects (AIA), Engineers Joint Contract Documents Committee (EJCDC), ConsensusDocs, International Federation of Consulting Engineers (FIDIC), Joint Contracts Tribunal (JCT), and New Engineering Contract (NEC). In fact, contract conditions governing the administration of construction claims and disputes play a critical role, in that their underlying resolution mechanisms, when devised properly, can be expected to help expeditiously track the evolution of claims and disputes leading to their resolution. Such successful outcomes act to counteract the detrimental repercussions of unresolved claims on the progress of the project and the relationship between the parties to the contract. However, the literature is found to be lacking research work that can measure the efficiency of any proposed claim/dispute resolution mechanism or can advise as to an optimal (if any exists) such mechanism.

Therefore, this research aimed at rigorously studying and analyzing the claim/dispute resolution mechanisms set forth in various standard conditions in order to assess their offered capabilities and merits on the progression of claims and disputes. The adopted methodology included: (1) performing a comprehensive analysis of the claim/dispute mechanisms, adopted by the aforementioned standard conditions, (2) investigating the spectrum of judgment-rendering roles and their properties, (3) synthesizing an all-encompassing timeline that covers all options that can be possibly applied within each of its modules while pinpointing their differences to aid contracting parties in adopting the most suitable one, (4) designing an agent-based model to simulate the progression of claims and visualize various scenarios, and (5) proposing a claim/dispute framework that can be viewed as optimal in promoting a more efficient tracking and progression of claims and disputes.

The conducted research revealed several findings. The all-encompassing timeline, merging the full continuum of standardized mechanisms, showed that the phases of disclosure of claims, initial judgment, alternative dispute resolution, and arbitration are core to any claim and dispute resolution framework. However, other additional phases of alternative dispute resolution, discussions, and amicable settlement, albeit being optional, can be sequenced differently. On the other hand, the agent-based simulation models showed that the presence of discussions, mediation, and adjudication is essential in order to have a higher possibility of resolving claims prior to being referred to arbitration. Finally, the simulation models revealed that the significant phases can be best sequenced as follows: disclosure of claim, discussions, initial judgment, adjudication, mediation, and arbitration.

CONTENTS

ACKNOWLEDGMENTS	v
ABSTRACT	vi
LIST OF ILLUSTRATIONS	xiii
LIST OF TABLES	xviii
Chapter	
I. INTRODUCTION	1
A. Preamble	1
B. Proposal Outline	4
II. LITERATURE REVIEW	6
A. Construction Claims/Disputes	6
B. Types Of Claims/Disputes	7
1. Incident-Based Claims Vs. Global Claims	7
2. Contractual Claims Vs. Speculative Claims	8
a. Contract Incompleteness	8
b. Task Factor	8
c. People Factor	9
d. Types Of Disputes	10
3. Causes Of Claims	10
4. Effects Of Claims	17
5. Management Of Claims	18
a. Identification	19
b. Notification	20
c. Examination	21
d. Documentation	23
e. Presentation	24
f. Negotiation	25
6. Underlying Mechanisms	26
a. Two-Step Approach Vs. Multistep Approach	26
b. Standardized Mechanisms	27
7. Simulation	29
a. Discrete-Event Simulation	30

b. System Dynamics	30
c. Agent-Based Modeling	31
i. MASCOT Model	32
ii. MAS-COR Model.....	34
III. RESEARCH MOTIVATION, OBJECTIVES, AND	
CONTRIBUTIONS	35
A. Research Statement And Motivation	35
B. Research Questions.....	36
C. Research Goals And Contributions.....	37
IV. METHODOLOGY	40
A. Phase 1: Standardized Global Timelines	40
B. Phase 2	41
1. Detailed Frameworks	41
2. Judgment Roles.....	42
3. Comparison Of Standardized Mechanisms.....	42
4. All-Encompassing Timeline	43
C. Phase 3	43
1. Simulation.....	43
2. Optimal Mechanism.....	44
V. PARTICULARIZED ANALYSIS OF STANDARDIZED	
MECHANISMS	45
A. Preamble	45
B. AIA Claim/Dispute Resolution Mechanism.....	46
1. Underlying Claim Mechanism.....	47
2. Detailed Analysis	50
a. Module A: Initial Review	51
b. Module B: Mediation.....	56
c. Module C: Binding Dispute Resolution.....	59
3. Underlying Mechanism’s Process Flowchart	61

4.	Discussion.....	63
a.	Initial Decision Maker	63
b.	The Expeditious Mechanism	64
c.	Mediation Process.....	65
d.	The Dragging Effect	66
e.	AIA Conditions 2007 Vs. AIA Conditions 2017.....	68
5.	Summary And Conclusions	71
C.	Consensusdocs Claim/Dispute Resolution Mechanism.....	72
1.	Underlying Claim/Dispute Mechanism	73
a.	Initial Review Module	74
b.	Direct Discussions Module.....	75
c.	Mitigation/Mediation Module.....	77
2.	Claim/Dispute Process Evolution Flowchart.....	79
3.	Discussions	82
a.	First Discussions	82
b.	Unregulated Periods.....	83
D.	EJCDC Claim/Dispute Resolution Mechanism.....	83
1.	Research Methodology	84
2.	Underlying Claim Progression Mechanism.....	84
3.	Detailed Analysis Of The Claim Timeline	87
a.	Scenario A.....	88
b.	Scenario B.....	90
c.	Scenario C.....	91
d.	Scenario D.....	92
4.	Flowchart Of Claim Process Evolution	94
5.	Discussion.....	98
a.	Owner-Contractor Communication	99
b.	Rooms For Resolving Claims	100
c.	Review And Resolution Stage’s Underlying Properties.....	101
d.	Mediation Process Characteristics	102
e.	Receiving Party Action.....	103
f.	Dispute Closure/Final Resolution.....	104
6.	Recommendations.....	105
7.	Conclusion	106
E.	FIDIC Claim/Dispute Resolution Mechanism.....	108
1.	Research Methodology	108
2.	The Underlying Claim/Dispute Resolution Mechanism.....	109
3.	Detailed Analysis	110
a.	Disclosure Of Claim	111
b.	Engineer’s Consultation.....	114
c.	Engineer’s Determination	116
d.	Adjudication.....	121
4.	Claim Process Evolution Flowchart	123

5.	Discussion.....	127
a.	The Engineer.....	127
b.	Full-Term Dispute Avoidance/Adjudication Board	129
c.	FIDIC 1999 Versus FIDIC 2017	129
i.	Disclosure Of Claim	130
ii.	Engineer’s Consultation And Determination.....	130
iii.	Referral Of Disputes To DAAB	132
iv.	Amicable Settlement.....	133
F.	NEC Claim/Dispute Resolution Mechanism	134
1.	Research Methodology	135
2.	Underlying Claim/Dispute Mechanism	135
3.	Detailed Analysis	138
a.	Compensation Event	138
b.	Dispute Resolution.....	143
i.	Option W1.....	144
ii.	Option W2.....	147
4.	Claim Evolution Process Flowchart	149
5.	Discussion.....	153
a.	Project Manager.....	155
b.	Notification Of Failure.....	157
c.	Adjudication: Option W1 Versus Option W2.....	158
d.	Rooms For Alternative Dispute Resolution Techniques	159
G.	JCT Claim/Dispute Resolution Mechanism	160
1.	Underlying Claim/Dispute Mechanism	160
2.	Detailed Timelines	161
a.	Adjustment Of Completion Date	161
b.	Loss And Expense	163
c.	Settlement Of Disputes	164
3.	Discussion.....	168
a.	Disclosure Of Claim Time-Bars	169
b.	Adjustment Of Completion Date Versus Loss And Expense	169
c.	Mediation	170
d.	Adjudication’s Decision	170

VI. COMPARATIVE ANALYSIS OF STANDARDIZED

MECHANISMS..... 172

A.	Preamble	172
B.	The All-Encompassing Timeline	173
1.	Standardized Claims/Disputes Timelines	174

a.	AIA Claims/Disputes Timeline	174
b.	Consensusdocs Claims/Disputes Timeline	177
c.	EJCDC Claims/Disputes Timeline	178
d.	FIDIC Claims/Disputes Timeline	180
e.	JCT Claims/Disputes Timeline	182
f.	NEC Claims/Disputes Timeline.....	184
2.	Deduced Spectrum Of Progression Steps	188
3.	Deduced Steps' Operational Variations.....	189
a.	Disclosure Of Claim Phase	189
i.	Notice Of Claim.....	189
ii.	Supporting Documents	192
b.	Discussions Phase	196
c.	Initial Judgment Phase	197
d.	ADR Phase.....	200
i.	Mediation	200
ii.	Adjudication.....	205
e.	Other Phases	208
4.	The All-Encompassing Claim/Dispute Mechanism	209
5.	Practical Implications Of The Constructed All-Encompassing Timeline ...	212
C.	Judgements Rendered By Engineering Professionals.....	213
1.	Methodology And Contributions	214
2.	Engineering Professional Roles	216
a.	Roles Under FIDIC Conditions	216
b.	Roles Under EJCDC	218
c.	Roles Under AIA	220
d.	Roles Under Consensusdocs.....	223
e.	Roles Under JCT.....	225
f.	Roles Under NEC	227
3.	Role Capacities And Judgement Properties.....	228
4.	Judgement-Rendering Guiding Principles	231
VII.	SIMULATION MODELING	234
A.	Preamble	234
B.	The Best-Suited Simulation Technique	235
1.	Claim/Dispute Timeline.....	236
2.	Simulation Techniques	237
a.	Discrete-Event Simulation.....	237
b.	System Dynamics	239
c.	Agent-Based Modeling	240
3.	Discussion	242
C.	Simulation Modeling	244

1.	Methodology	244
2.	Conceptual Models	245
3.	Simulation Rules	246
a.	Disclosure Of Claims	247
b.	Judgments	248
c.	Consultations And Discussions	249
d.	Mediation	250
e.	Amicable Settlement	252
f.	Other Rules	253
4.	Model Verification And Validation	254
5.	ABM Model	256
a.	Main Environment	256
b.	The Owner's, The Contractor's, And The Engineering Professional's Environment	257
c.	The AIA Simulation Model	257
d.	The Consensusdocs Simulation Model	261
e.	The EJCDC Simulation Model	263
f.	The FIDIC Simulation Model	265
g.	The JCT Simulation Model	268
h.	The NEC Simulation Model	270
6.	Results Of The ABM Model	274
7.	Construction Of The Suggested Optimum Claim And Dispute Resolution Mechanism	277
a.	The Selected Phases	278
b.	Initial Judgment	280
c.	Discussions/Consultations	282
d.	Adjudication	284
e.	Mediation	285
8.	The Suggested Optimum Claim/Dispute Resolution Mechanism	287
 VIII. CONCLUSION AND RECOMMENDATIONS		289
 A. Preamble		 289
B. Summary Of Methodology		290
C. Contributions		291
D. Recommendations		293
E. Limitations And Future Work		295
 BIBLIOGRAPHY		 298

ILLUSTRATIONS

Figure 1. Evolvement of Dispute.....	7
Figure 2. Contractual Dispute vs. Speculative Dispute	10
Figure 3. Cause-Effect Relationship (Iyer et al. 2008).....	17
Figure 4. MASCOT Process Model (Ren et al. 2003).....	33
Figure 5. MAS-COR Model (El-adaway and Kandil 2009).....	34
Figure 6. Research Methodology.....	41
Figure 7. Extracted Schematic Claim/Dispute Timeline	48
Figure 8. Initial review module.....	52
Figure 9. Possible actions taken versus initial decision rendered.....	53
Figure 10. Mediation module with initial decision being rendered.....	57
Figure 11. Mediation module with no initial decision being rendered.....	59
Figure 12. Binding dispute resolution module.....	60
Figure 13. Practitioners' guide map.....	62
Figure 14. Worst-case scenario.....	67
Figure 15. Mediation's mechanism: AIA 2007 vs. AIA 2017.....	69
Figure 16. Binding dispute resolution's mechanism: AIA 2007 vs. AIA 2017.....	70
Figure 17. ConsensusDocs Schematic Claim/Dispute Resolution Timeline.....	74
Figure 18. Initial Review Module.....	75
Figure 19. Direct Discussions Module	76
Figure 20. Dispute Mitigation Procedures.....	77
Figure 21. Mediation Procedure	78
Figure 22. Claim/Dispute Resolution Process Flowchart.....	81
Figure 23. Schematic Claim/Dispute Timeline.....	85

Figure 24. No Mediation Conducted	89
Figure 25. Mediation Conducted and Agreement Reached	90
Figure 26. Mediation Ended Prior to the Expiry Of “Review and Resolution” Stage – No Agreement Reached	92
Figure 27. Mediation Ended After the Expiry Of “Review and Resolution” Stage – No Agreement Reached.....	93
Figure 28. Misinterpretation of Interaction Between Mediation and Decision Process .	94
Figure 29. Flowchart of Claim Process Evolution.....	96
Figure 30. Schematic Claims/Disputes Timeline	109
Figure 31. Disclosure of Claims	112
Figure 32. Fully Detailed Claim Lacking Contractual and/or Other Legal Basis	115
Figure 33. Consultation Phase: Engineer issuing a notice prior to the expiry of the consultation’s time-bar	117
Figure 34. Notice of Engineer's Determination	118
Figure 35. Correction of Errors.....	119
Figure 36. Referring Disputes to DAAB	120
Figure 37. Adjudication Process	122
Figure 38. Claim Process Flowchart.....	125
Figure 39. Modifications of the Disclosure of Claims.....	131
Figure 40. Modifications of the Engineer's Consultation and Determination	132
Figure 41. Modifications of the Referral of Disputes to Adjudication	133
Figure 42. Modifications of the Amicable Settlement Phase	134
Figure 43. Claim/Dispute Mechanism	135
Figure 44. Compensation Event Mechanism	136

Figure 45. Dispute Resolution	138
Figure 46. Project Manager's Decision	141
Figure 47. PM Accepting Quotation, Rejecting It, or Instructing to Submit a Revised One.....	142
Figure 48. PM Making Own Assessment	143
Figure 49. Dispute Resolution W1	146
Figure 50. Dispute Resolution W2	148
Figure 51. Claim Evolution Flowchart: Compensation Event.....	152
Figure 52. Claim Evolution Flowchart: Dispute Resolution	154
Figure 53. Overall Claim/Dispute Mechanism	161
Figure 54. Timeline of Claims for the Adjustment of Completion Date	162
Figure 55. Timeline of Claims for Loss and Expense	163
Figure 56. Timeline of Dispute Settlement.....	165
Figure 57. Selection of Adjudicator.....	166
Figure 58. AIA Claim/Dispute Resolution Timeline.....	176
Figure 59. ConsensusDocs Claim/Dispute Resolution Timeline.....	178
Figure 60 . EJCDC Claim/Dispute Resolution Timeline.....	179
Figure 61. FIDIC Claim/Dispute Resolution Timeline	180
Figure 62. JCT Claims Resolution Timeline	183
Figure 63. JCT Disputes Resolution Timeline.....	184
Figure 64. NEC Claim Resolution Timeline	185
Figure 65. NEC Dispute Resolution Timeline (W1)	186
Figure 66. NEC Dispute Resolution Timeline (W2)	187
Figure 67. Claim/Dispute Resolution Mechanisms Spectrum.....	188

Figure 68. Notice of Claim Factors	191
Figure 69. Supporting Documents Factors	193
Figure 70. Initial Judgment Factors	199
Figure 71. Mediation Factors (1/2)	202
Figure 72. Mediation Factors (2/2)	204
Figure 73. Adjudication Factors	207
Figure 74. The All-Encompassing Claim/Dispute Timeline	209
Figure 75. Rooms for ADR.....	210
Figure 76. Research Methodology.....	215
Figure 77. FIDIC Claim Process Stages	216
Figure 78. EJCDC Claim Process Stages	219
Figure 79. AIA CLaim Process Stages	222
Figure 80. ConsensusDocs Claim Process Stages	224
Figure 81. JCT Claim/Dispute Process Stages	226
Figure 82. NEC Claim/Dispute Process Stages	227
Figure 83. Independency and Impartiality Scales.....	229
Figure 84. Judgement's Rendering Buffer	232
Figure 85. Claim Timeline.....	236
Figure 86. Simulating Claim/Dispute Timeline using DES	238
Figure 87. Simulating Claim/Dispute Timeline using SD.....	240
Figure 88. Simulating Claim/Dispute Timeline using ABM.....	241
Figure 89. ABM Model Setup	245
Figure 90. Main Environment.....	256
Figure 91. Project Parties' Environment	258

Figure 92. AIA Claim Agent Statechart	259
Figure 93. ConsensusDocs Claim Agent Statechart	262
Figure 94. EJCDC Claim Agent Statechart	264
Figure 95. FIDIC Claim Agent Statechart	266
Figure 96. JCT Claim Agent Statechart.....	269
Figure 97. NEC Claim Agent Statechart	272
Figure 98. Frequency of Outputs Under The AIA Conditions	274
Figure 99. Frequency of Outputs Under The ConsensusDocs Conditions	275
Figure 100. Frequency of Outputs Under The EJCDC Conditions	276
Figure 101. Frequency of Outputs Under The FIDIC Conditions.....	276
Figure 102. Frequency of Outputs Under The JCT Conditions.....	277
Figure 103. Frequency of Outputs Under The NEC Conditions	278
Figure 104. Percentage of Claims Not Being Resolved	280
Figure 105. Average Time to Have an Initial Judgment.....	281
Figure 106. Percentage of Claims Resolved Through Consultation.....	283
Figure 107. Percentage of Claims Resolved Through Mediation.....	285
Figure 108. The Suggested-Optimum Claim/Dispute Resolution Mechanism	288

TABLES

Table 1. Causes of Conflicts and Disputes (Mitkus and Mitkus 2014)	12
Table 2. Relative Importance of Causes of Claims (Cakmak and Cakmak 2014)	13
Table 3. Ranks of Causes of Claims (Zaneldin 2006)	15
Table 4. Causes of Dispute in the ME region (Awwad et al. 2016)	16
Table 5. Problems in Identification of Claims (Bakhary et al. 2015).....	19
Table 6. Problems in Notification of Claims (Bakhary et al. 2015)	21
Table 7. Problems in Examination of Claims (Bakhary et al. 2015)	22
Table 8. Problems in Documentation of Claims (Bakhary et al. 2015).....	23
Table 9. Problems in Presentation of Claims (Bakhary et al. 2015).....	24
Table 10. Problems in Negotiation of Claims (Bakhary et al. 2015).....	25
Table 11. Application of ABM in The Construction Field (Liang et al. 2016)	32
Table 12. Claim Process Stages	50
Table 13. Claim Process Stages	87
Table 14. Judgements Rendered Under FIDIC.....	218
Table 15. Judgements Rendered Under EJCDC	220
Table 16. Judgements Rendered Under AIA	223
Table 17. Judgements Rendered Under ConsensusDocs.....	225
Table 18. Judgements Rendered Under JCT	227
Table 19. Judgements Rendered Under NEC	228
Table 20. Choose-by-Advantage of the Three Simulation Techniques.....	243
Table 21. Negotiation Significant Factors' Values	250
Table 22. Amicable Settlement Significant Factors' Values	253
Table 23. Resolution Rooms.....	280

CHAPTER I

INTRODUCTION

A. Preamble

A construction project can be defined as a teamwork process where the collaboration of the owner, architect, engineer, contractor, and supplier is essential for the successful delivery of the project (Lightening Up Litigiousness 1999). Critical to such collaboration is having an effective communication between the contracting parties (Jahren and Dammeier 1990, Fenn et al. 1997, Gorse and Emmitt 2003). As such, an acceptable level of communication must be established and maintained throughout the project's life cycle, which can be achieved through the use of a well-prepared and drafted contract (Kennedy et al. 1997). The construction contract comprises the set of documents stipulating: (1) the basis for the relationships between the contractual parties (Semple et al. 1994), (2) their obligations and rights (Cheung et al. 2006), and (3) the procedures to be followed by the contracting parties (Hughes and Greenwood 1996, Ndekugri et al. 2007, Podvezko et al. 2010, El-adaway et al. 2016). As a matter of fact, a well-prepared contract: (1) ensures a smooth flow of the works within a construction project upon creating an acceptable level of communication (Rameezdeen and Rodrigo 2013), (2) lessens business risks, and (3) increases the effectiveness of the construction processes (Podvezko et al. 2010). A proper contract execution can, thereby, allow the

successful delivery of construction projects (Rameezdeen and Rodrigo 2013), which, in turn, can directly impact the economic success of the contractual parties (Podvezko et al. 2010).

Owing to the increasing complexity of projects, there is a need to develop more comprehensive contracts addressing various financial, technical, and legal aspects of the project in question (Bubshait and Almohawis 1994, Cheung et al. 2008, Iyer et al. 2008, Cheung et al. 2012). As a result, the need for specialized knowledge and skills is regarded as a core prerequisite to the drafting of such complex contracts (Podvezko et al. 2010), and, as such, professional bodies have developed standardized forms of general conditions that are being used widely in the construction industry (Bubshait and Almohawis 1994). The major advantage of adopting standard conditions is the familiarity of the contractual parties with the pertinent contract's provisions (Bubshait and Almohawis 1994). Such familiarity: (1) facilitates a greater sense of partnership between the owner and the contractor (Jergas and Hartman 1994) due to the fair allocation of risks (Kwakye 1997), (2) reduces the time and effort associated with the repetitive preparation of contracts, and (3) lessens contingencies within the bid prices (Jergas and Hartman 1994, Bubshait and Almohawis 1994). Besides, another major advantage of adopting standardized contracts is that their conditions have been court tested frequently and their legal interpretation is well known (Hinze 2001).

On the other hand, the increasing complexity of contracts, in addition to that of construction projects, increased the number of arising disputes (McManamy 1994,

Abdul-Malak et al. 2002). This is due to the fact that contracts are inevitably incomplete, where it is impossible to incorporate provisions to deal with the enormous uncertainties encountered during the course of the construction project (Cheung et al. 2006, Cheung et al. 2012). In fact, all efforts exerted to eliminate either the number or the magnitude of conflicts were unsuccessful (ASCE Technical Committee 1991), where several studies concluded that construction conflicts are inevitable (Hughes 1985, Bramble and Cipollini 1995, Zack 1995, Fenn et al. 1997, Overcash 1998, Pinnell 1999, Carsmen 2000, Braimah 2013). Therefore, Diekmann et al. (1994) argued that the successful delivery of construction projects depends on how the corresponding parties approach problems and conflicts.

Contract conditions stipulate that either the owner or the contractor shall submit a claim with respect to the arising conflict and follow the mechanism set forth in the relevant provisions in order to reach a resolution. As quoted in Levin (1998), the American Institute of Architects defines a claim as “a demand or assertion by one of the contracting parties seeking, as a matter of right, adjustment or interpretation of the contract terms, payment of money, extension of time, or other relief with respect to the terms of the contract.” However, claims are never reduced with time if left unresolved (Didonato 1993, Harmon 2001). On the contrary, claims evolve into disputes and could lead to major consequences, namely impacting negatively the relationship and communication of the contracting parties (Rhys Jones 1994, Conlin et al. 1996, Mix

1997, Arditi et al. 1998, Steen and MacPherson 2000, Harmon 2003, Ng et al. 2007, Cheung et al. 2012, Ofori 2013) and the progress of the project (Harmon 2003).

To increase the chances of resolving a claim, the claimant shall follow the steps stipulated in the conditions of the contract. However, the available standard conditions implement different claim/dispute mechanisms. The differences are, most commonly, manifest in the stages of the underlying mechanisms, their time-bars, and sequencing, which party is addressed during each stage, and the possible scenarios that can be encountered.

B. Proposal Outline

The upcoming sections of the proposal are organized as follows.

- Chapter 2 presents a comprehensive review of the literature, where it covers the general topics of claims while focusing on standardized mechanisms.
- Chapter 3 discusses the research motivation, objectives, and contributions.
- Chapter 4 illustrates the methodology, that is divided into three phases: (1) standardized global mechanisms, (2) detailed analysis, and (3) simulation.
- Chapter 5 presents the particularized analysis of the standardized claim/dispute resolution mechanisms.
- Chapter 6 provides a comparison of the standardized mechanisms and the all-encompassing claim/dispute resolution timeline.

- Chapter 7 offers the evaluation of the standardized claim/dispute resolution mechanisms using agent-based simulation modeling.
- Chapter 8 provides a conclusion and recommendations of the attained research study.

CHAPTER II

LITERATURE REVIEW

The unstructured and dynamic nature of construction projects and the on-site work complexities have inevitably led to claims. Contractors resort to construction claims to recover additional incurred costs during the construction period and/or to extend the project completion date to avoid the onset of liquidated damages. On the other hand, in case of poor quality of execution and/or delayed completion of the project by the contractor, the owner may submit claims to recuperate incurred costs (Fawzy and El-adaway 2012).

A. Construction Claims/Disputes

Acharya et al. (2006) illustrated the process of evolvement of disputes as shown in Figure 1. Initially, any risk that is not clearly assigned has a potential to become a conflict. Once a conflict arises, it has to be clearly managed. Otherwise, it escalates to a claim, where parties at this level shall seek resolution as stipulated in the relevant provisions. In case agreement is not reached, the situation deteriorates, where a claim evolves into a dispute.



Figure 1. Evolvement of Dispute

When assessing a raised claim, two factors must be examined: the eligibility of the claim and its magnitude. Initially, the claimant must prove eligibility to claim for additional time and/or extra cost. As such, the claimant shall substantiate the occurrence of the event that gave rise to the claim. Besides, the contract shall stipulate that the occurred event entitles the claimant for additional time/cost. As a matter of fact, any notice of claim issued shall reference the relevant provision(s) that supports the claimant's prerogative. Fulfilling these requirements assures the eligibility of the claim. Subsequently, the claimant shall justify the quantum of the claim. In this regard, the claimant shall prove the consequences of the trigger event in terms of its impact on the time of completion of the project, its budget, or both.

B. Types of Claims/Disputes

1. Incident-Based Claims vs. Global Claims

All claims arising during the course of a construction project are filed for additional costs and/or extension of time. In this regard, claims can either be incident-based claims or global claims. The claimant resorts to an incident-based claim in the case where the event giving rise to claim can be identified and tracked, and the quantum of the claim

can be evaluated and quantified. On the contrary, when the events triggering the claims cannot be separately identified, the claimant resorts to a global claim, where the claimant claims for an aggregated sum of the additional incurred costs and the delayed time (Haidar 2011).

2. Contractual Claims vs. Speculative Claims

Another study conducted by Cheung and Pang (2012) categorizes disputes either as contractual disputes or speculative disputes. To categorize a dispute as such, three contributors shall be defined, (1) contract incompleteness, (2) task factor, and (3) people factor.

a. Contract Incompleteness

Owners of the construction projects tend to allocate risk inequitably, where contractors bear most of the risks. However, these organizations fail to anticipate contingencies due to bounded rationality. As such, contracts are considered to be unavoidably incomplete due to (1) ambiguities, (2) deficiencies, (3) inconsistencies, and (4) defectiveness. Consequently, the contract incompleteness is considered a key contributor to disputes.

b. Task Factor

As the ambiguities of the contract documents increase, the difficulty of interpreting such documents increase. As such, divergent and biased views will exist regarding the rights

and responsibilities of the parties. Such discrepancy in task allocation causes disputes. In addition, whenever a task involves the collaboration of several parties, there exists a higher tendency for disputes to evolve. For illustration, the failure of the consultant to provide adequate drawings allows the owner to introduce changes frequently. Consequently, the construction works will be delayed. As such, if these issues would not be addressed appropriately and timely, they can escalate to a dispute level. Hence, both task factors, collaborative conflict as well as risk and uncertainty, are considered to be contributors of disputes.

c. People Factor

Involved people are considered to be a key factor of disputes as their behaviors, cognitions, and emotions may lead to conflicts. Behavioral conflicts stem from the opportunistic strategies in construction claims. For example, the competition in the construction industry may push contractors to bid opportunistically in tenders. This also applies to all contracting parties where they tend to behave opportunistically in an attempt to maximize their own benefits and profitability. On the other hand, cognitive conflicts arise due to collaboration issues encountered during the course of the construction project. In simple terms, behavioral conflicts are purposely perpetrated for the maximization of monetary gains, whereas cognitive conflicts arise naturally due to genuine problems involving multi-party collaboration. These problems affect the successful delivery of the project. Moving to the personal and interpersonal level,

emotional conflicts may arise among project team members and could hinder efforts to resolve disputes.

d. Types of Disputes

Whether a dispute is contractual or speculative, contractual incompleteness is always considered to be a common root cause for both types, as shown in Figure 2. However, when a dispute arises due to a task factor, it is considered to be a contractual dispute. On the other hand, a dispute is considered speculative if it arises due to a people factor.

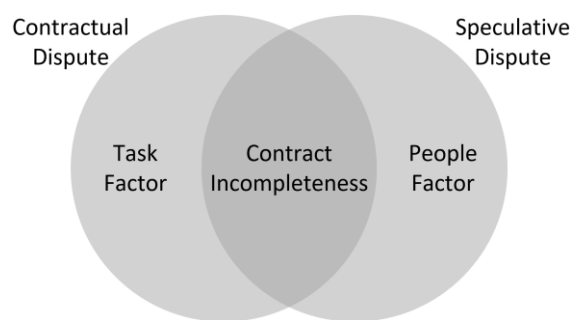


Figure 2. Contractual Dispute vs. Speculative Dispute

3. Causes of Claims

The volume of construction claims has significantly increased in the past thirty years (El-adaway and Kandil 2009). Consequently, the inevitable nature of construction claims motivated researches to investigate the causes of claims, which, in turn, could enable parties to avoid them or at least lessen their occurrences and/or consequences. In

fact, numerous studies focusing on this issue were found in the literature. For instance, Mitropoulos and Howell (2001) identified the organizational, planning, and contractual problems as the main causes of construction claims. Similarly, Levin (1998) highlighted the three issues that could directly cause a claim: (1) the complexity of the construction project in question, (2) the competitive nature of bidding that forces the contractors to have inflexible price structure that is not capable of absorbing unforeseen additional costs, and (3) the inequitable allocation of risks, most commonly allocated to the contractor. In a further study, Harmon (2003) indicated that construction claims arise mainly due to (1) the size and duration of the project, (2) the complexity of contract documents, (3) poor communication, (4) inadequate design, (5) financial constraints, (6) limited resources, (7) labor issues, and (8) force majeure events. Other studies also identified cases that gave rise to claims, namely (1) differing site conditions (Thomas et al. 1992), (2) defective specifications (Thomas et al. 1994, 1995), (3) increase in scope of work, (4) restricted access to site, (5) owner-caused disruptions or delays (De La Garza et al. 1991), (6) interpretation of site instructions, (7) disagreement as to what constitutes substantial completion, and (8) enforcement of liquidated damages, among others (Abdul-Malak et al. 2002).

Furthermore, Mitkus and Mitkus (2014) expanded the list of causes of conflicts and disputes that were illustrated in the literature and these were systematized by Love et al. (2010). As such, these causes are summarized in Table 1.

Table 1. Causes of Conflicts and Disputes (Mitkus and Mitkus 2014)

Research	Sources of dispute
Blake Dawson Waldron (2006)	1. Changes of conditions 2. Interpretation 3. Workplace conditions 4. Communications 5. Law 6. Access to construction site 7. Access to materials
Cheung & Yiu (2006)	1. Management 2. Communication 3. People 4. Contract documents
Yiu & Cheung (2007)	1. Delay 2. Unrealistic expectations
Killian (2003)	1. Change Orders 2. Pre-Award Design 3. Pre-Construction 4. Quality Assurance
Mitropoulos & Howell (2001)	1. Uncertainty 2. Contractual problems 3. Opportunistic behavior
Kumaraswamy (1997)	1. Changes of conditions 2. Changes of scope 3. Design 4. Unpredictability 5. Contract documents 6. Management 7. Delay 8. Communications 9. Unrealistic expectations
Colin <i>et al.</i> (1996)	1. Payment 2. Performance 3. Delay 4. Negligence 5. Quality 6. Administration
Sykes (1996)	1. Misunderstanding 2. Unpredictability
Bristow & Vasilopoulos (1995)	1. Unrealistic expectations 2. Contract documents 3. Communications 4. Lack of team spirit 5. Changes
Diekmann <i>et al.</i> (1994)	1. People 2. Process 3. Product
Heath <i>et al.</i> (1994)	1. Change of scope 2. Change in conditions 3. Delay 4. Distribution 5. Acceleration
Rhys-Jones (1994)	1. Management 2. Culture 3. Communication 4. Design 5. Economics 6. Termination 6. Tendering pressures 7. Law 8. Unrealistic expectations 9. Contracts 10. Workmanship
Sample <i>et al.</i> (1994)	1. Acceleration 2. Access 3. Whether 4. Changes
Watts & Scrivener (1992)	1. Change 2. Law 3. Delay
Hawitt (1991)	1. Change of scope 2. Change of condition 3. Acceleration 4. Delay 5. Disruption 6. termination

Cakmak and Cakmak (2014) conducted a similar research and extracted 28 causes of construction claims that were identified in the literature. Depending on the nature of causes and their mode of occurrence, the authors aggregated the causes into 7 categories: (1) owner related, (2) contractor related, (3) design related, (4) contract related, (5) human behavior related, (6) project related, and (7) external factors. In addition, the authors implemented the analytical network process approach to determine the relative importance of each cause. Results were illustrated in Table 2.

Table 2. Relative Importance of Causes of Claims (Cakmak and Cakmak 2014)

Main Categories	Relative importance of main categories	Sub-categories	Relative importance of sub-categories
Owner related	0.081163	variations initiated by the owner	0.011806
		change of scope	0.018216
		late giving of possession	0.000382
		acceleration	0.000171
		unrealistic expectations	0.002524
		payment delays	0.048064
Contractor related	0.301548	delays in work progress	0.151231
		time extensions	0.122495
		financial failure of the contractor	0.000127
		technical inadequacy of the contractor	0.000171
		tendering	0.000101
		quality of works	0.027423
Design related	0.253987	design errors	0.054377
		inadequate / incomplete specifications	0.119561
		quality of design	0.071209
		availability of information	0.008840
Contract related	0.259314	ambiguities in contract documents	0.045363
		different interpretations of the contract provisions	0.019974
		risk allocation	0.027686
		other contractual problems	0.166291
Human behavior related	0.026826	adversarial / controversial culture	0.003531
		lack of communication	0.016504
		lack of team spirit	0.006792
Project related	0.037032	site conditions	0.018516
		unforeseen changes	0.018516
External factors	0.040127	weather	0.002434
		legal and economic factors	0.031776
		fragmented structure of the sector	0.005917

Upon further examining the relative importance of main categories, it was found that contractor-related disputes had the highest factor. As such, the authors concluded that contractor related disputes were the most common causes of claims in the construction industry. Six causes are categorized under contractor related disputes: (1) delays in work progress, (2) time extensions, (3) financial failure of contractor, (4) technical inadequacy of the contractor, (5) tendering, and (6) quality of works. However, when examining sub-categories, it was found that contractual problems outweigh others. As such, contractual problems are the main-direct cause of construction disputes. In addition, causes such as (1) delays in work progress, (2)

extension of time, (3) quality of design, (4) design errors, and (5) incomplete/inadequate specifications are considered to be key causes of disputes. On the contrary, it was found that the category related to human behavior and the project related category had the lowest importance factors. As such, these group factors were the least common ones in the construction industry.

Another study conducted by Zaneldin (2006) examined the relative importance of causes of construction claims in Dubai and Abu Dhabi. Zaneldin had access to the information of 124 construction claim cases, where 26 potential causes of claims were highlighted. Then, a questionnaire presenting the obtained causes was distributed to participating firms to evaluate the frequency of the aforementioned causes. The results obtained were summarized in Table 3. It was found that change or variation orders were ranked as 1, indicating that it is the most frequent cause of disputes in Dubai and Abu Dhabi.

Table 3. Ranks of Causes of Claims (Zaneldin 2006)

Ranking of each cause of claims based on their frequencies

Causes of claims	Importance index (%)	Rank
Change or variation orders	55.0	1
Delay caused by owner	52.5	2
Oral change orders by owner	51.4	3
Delay in payments by owner	48.9	4
Low price of contract due to high competition	48.6	5
Changes in material and labor costs	46.1	6
Owner personality	45.1	7
Variations in quantities	44.7	8
Subcontracting problems	44.0	9
Delay caused by contractor	43.7	10
Contractor is not well organized	43.7	10
Contractor financial problems	43.7	10
Bad quality of contractor's work	42.6	13
Government regulations	40.1	14
Estimating errors	39.1	15
Scheduling errors	39.1	15
Design errors or omissions	38.4	17
Execution errors	37.7	18
Bad communication between parties	37.7	18
Subsurface problems	37.0	20
Specifications and drawings inconsistencies	35.6	21
Termination of work	35.6	21
Poorly written contracts	33.8	23
Suspension of work	33.8	23
Accidents	33.1	25
Planning errors	32.7	26

Another research effort by Awwad et al. (2016) identified the most significant causes of disputes in the Middle East region. Based on a thorough review of the pertinent publications, the authors identified 12 causes of disputes and categorized them into 3 groups: (1) administrative causes, (2) contractual causes, and (3) cultural causes. Findings are summarized in Table 4.

Table 4. Causes of Dispute in the ME region (Awwad et al. 2016)

Type	Cause	Daoud and Azzam (1999)	Abd El-Razek et al. (2007)	Financier Worldwide (2010)	Marzouk et al. (2011)	Dmadi et al. (2013)	EC Harris (2013a)
Administrative	A failure to properly administer the contract	X	—	—	—	—	X
	Unprofessional documentation by the management	X	—	—	—	—	—
	Unbalanced bidding, underestimation and incompetence of contractors	—	X	—	—	—	X
Contractual	Failure to make interim awards on extensions of time and compensation by the owner	—	X	X	—	—	—
	Amending the standard contract conditions shifting most of the risk to the contractor	X	—	—	—	—	X
	Inadequate or incomplete technical plans/specifications	—	—	—	X	—	X
	Contradictory and inaccurate information in the contract documents	X	X	—	X	—	—
	Owner not respecting contract obligations	—	—	X	X	—	X
	Contractor not respecting contract obligations	—	—	X	X	—	X
	Variations initiated by the owner/consultant (additive/deductive)	—	X	—	X	X	X
Cultural	Legislation and regulations are always being modified (leading to changes in material prices and other unexpected circumstances)	X	X	—	—	X	—
	Impact of local cultures and social values in the settlement of conflicts	X	—	—	—	X	—

Administrative causes of disputes typically exist due to deficiencies in the managerial skills of staff members which lead to improper administration of construction contracts. On the other hand, contractual causes are considered to be either intra-contractual or party-specific. Intra-contractual causes arise due to the nature of the adopted standard conditions of the construction contract. This category reflects the ambiguous, deficient, inconsistent, and defective nature of the contract language. Party-specific causes, however, reflect a rather inadequate implementation of the contract provisions by the contracting parties. When it comes to a more region-specific set of causes, cultural underlying factors related to the Middle East’s geopolitical risks, political instability, and French-originated legal systems dominate (Awwad et al. 2016).

4. Effects of Claims

Effects of construction claims are categorized as direct and indirect ones. Direct effects are the ones used to quantify the magnitude of the claim, whether it is a time-related delay, additional costs, or both. In some cases, there exists a cause-effect relationship. Iyer et al. (2008) argued that the effect of one claim can be the cause of another one, as shown in Figure 3.

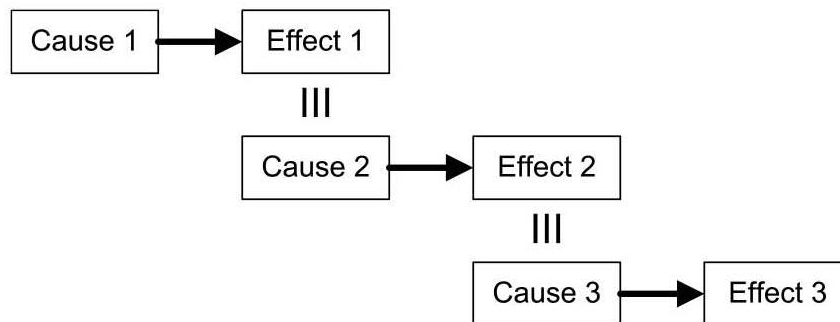


Figure 3. Cause-Effect Relationship (Iyer et al. 2008)

On the other hand, claims lead to indirect consequences. Claims tend to develop adversarial relationship between the involved parties and affect the progress of the construction project. Because of these detrimental consequences, the Wood Report (1975) described construction claims as “the most vexatious areas of contractual relationships”. Therefore, the contracting parties must handle these issues seriously and manage claims successfully.

5. Management of Claims

To lessen the problematic nature of claims, two approaches can be adopted: understanding contract clauses and allocating risks equitably (Thomas et al. 1994). For example, adequate understanding of the contract clauses enables the contracting parties to (1) properly interpret the contractual language of new contracts, (2) comprehend the common terms that are used by arbitrators and courts, (3) highlight common misconceptions, and (4) amend the general conditions. However, even with the most equitable risk-allocation regime and the most expert understanding of contract provisions, claims will always cause problems if they were poorly managed (Vidogah and Ndekugri 1997). In fact, management of claims is a key challenge that is facing the owners and contractors of construction projects (Kululanga et al. 2001, Ren et al. 2001, El-adaway and Ezeldin 2007).

It is evident that contractors need a proper management setup and an effective organizational structure to reduce the chances of protracted claims. This would allow them to methodically justify the eligibility of claims, accurately quantify the quantum of claims, and present them to the owner and to the corresponding parties (Vidogah and Ndekugri 1997). Nonetheless, a comprehensive review of the literature on the subject showed that the construction claims management systems are facing a number of problems. In this regard, Bakhary et al. (2015) conducted a questionnaire-based survey to identify such problems by utilizing the input of 155 contractors and 49 consultants that participated in the survey. The authors tackled all stages of construction claims

management, including (1) identification, (2) notification, (3) examination, (4) documentation, (5) presentation, and (6) negotiation.

a. Identification

Identification of construction claims is the first step in the process of claim management. Identification is the process of detecting claims based on occurring incidents and notifying the corresponding authorities that are in charge of taking actions with respect to the arising claims. The responses of the participants indicated 9 problems associated with the identification of claims, as shown in Table 5.

Table 5. Problems in Identification of Claims (Bakhary et al. 2015)

Problems in Identification of Claims	Contractors		Consultants	
	Mean score	Ranking	Mean score	Ranking
Lack of awareness of site staff to notice a claim.	3.39	1	3.88	2
Insufficient contract knowledge by site staff.	3.32	2	3.69	4
Insufficient time due to high workload.	3.30	3	3.67	5
Insufficient skilled personnel for detecting a claim.	3.28	4	3.90	1
Difficulties in detecting any problems during the work due to high workload.	3.28	5	3.59	6
Poor communication between site and head office.	3.27	6	3.73	3
Inaccessibility of documents used for identifying a claim.	2.98	7	3.31	8
Ambiguous line of responsibility as to who should detect a claim.	2.91	8	3.33	7
Ambiguous procedures in claim identification.	2.84	9	3.31	9

The ranking of problems in the identification of claims was slightly different when considering the contractors' perspective versus that of the consultants. According to contractors, the top three problems in identification were (1) lack of awareness of site

staff to notice a claim, (2) insufficient contract knowledge by site staff, and (3) insufficient time due to high workload. When it comes to consultants, they ranked the following as top three problems of identification: (1) insufficient skilled personnel for detecting a claim, (2) lack of awareness of site staff to notice a claim, and (3) poor communication between site and head office.

Bakhara et al. (2015) stated that it was predictable that the minimal skills and awareness of the staff, or lack thereof, are the main problems faced during the identification of claims. Therefore, management must primarily raise awareness among site workers regarding the consequences of ignoring situations or events that could become bases for future claims and the adverse repercussions of missing the chance to officially document them in a timely manner. In addition, the staff shall be exposed to contract conditions while focusing on those relevant to claims.

b. Notification

Notification is the second step in the process of construction claims management, where the claimant shall issue a notice of claim to the other party. Eight problems in the notification of claims were identified and ranked as shown in Table 6.

According to contractors, the top three problems relating to the notifications stage of claims management are (1) inaccessibility of supporting documents, (2) ambiguous procedures in notice preparation, (3) poor communication/instruction to proceed with submitting the notice. Adding to these problems, consultants determined

the “insufficient time to thoroughly prepare the notice due to high workload” issue to be another major problem faced in notifications of claims. The following solutions shall be applied to address the aforementioned problems: (1) adopting an effective documentation system that holds all records accurately, (2) defining clearly the procedure of notice preparation, and (3) improving the communication skills of site staff in order to be able to give, receive, and understand instructions properly.

Table 6. Problems in Notification of Claims (Bakhary et al. 2015)

Problems in Notification of Claims	Contractors		Consultants	
	Mean score	Ranking	Mean score	Ranking
Inaccessibility of supporting documents needed for notice.	3.30	1	3.47	2
Ambiguous procedures in notice preparation.	3.10	2	3.41	4
Poor communication/instruction to proceed with submitting the notice.	3.10	3	3.63	1
Queries returned from the other parties due to notice ambiguity.	3.07	4	3.35	6
Insufficient time to thoroughly prepare the notice due to high workload.	3.07	5	3.47	3
Ambiguous responsibility as to who should prepare the notice.	2.99	6	3.39	5
Prescribed time in the contract is too short.	2.97	7	3.22	8
No standard form used for preparing the notice.	2.83	8	3.24	7

c. Examination

Whenever a claim is to be filed, the claimant shall quantify its magnitude accurately using documented facts and figures as means of proper substantiation. To that end, the consequences of the occurred event shall be examined to specify the impacts on the project’s duration and/or budget. Several problems are faced as part of the examination stage of this process. Table 7 illustrates these problems and ranks them accordingly.

It was found that the contractors and the consultants agree that the following are the top three problems faced during the examination of construction claims: (1) unavailability of records used to analyze and estimate the potential recovery, (2) insufficient time to thoroughly examine claim due to high workload, and (3) poor communication to gather the required information to analyze a claim. These findings highlight the importance of having an effective documentation system that is needed not only in the notification stage, but also in the examination one. Moreover, improving the communication skills of the staff is essential for the successful examination of claims. It is also advisable to dedicate a claims management team whose sole responsibility is the examination and management of new and ongoing claims.

Table 7. Problems in Examination of Claims (Bakhary et al. 2015)

Problems in Examination of Claims	Contractors		Consultants	
	Mean score	Ranking	Mean score	Ranking
Unavailability of records used to analyze and estimate the potential recovery.	3.28	1	3.84	1
Insufficient time to thoroughly examine claim due to high workload.	3.14	2	3.51	3
Poor communication to gather the required information to analyze a claim.	3.04	3	3.57	2
Lack of legal/contract to establish the base on which the claim stands.	2.96	4	3.51	4
Ambiguous procedures for claim examination.	2.92	5	3.24	6
No standard formula used to evaluate the impacts and calculating damages.	2.92	6	3.22	8
Ambiguous responsibility as who should evaluate the amount of recovery.	2.87	7	3.35	5
Unrealistic formula used to calculate damages.	2.72	8	3.24	7
Insufficient computerized machines to facilitate the calculation.	2.41	9	2.69	9

d. Documentation

The documentation system is the one in charge of keeping records, where contractors refer to documents to justify and quantify the alleged entitlement. As such, an effective documentation system is essential for claim management. The common problems faced in the documentation of claims are illustrated in Table 8.

Table 8. Problems in Documentation of Claims (Bakhary et al. 2015)

Problems in Documentation of Claims	Contractors		Consultants	
	Mean score	Ranking	Mean score	Ranking
Verbal instruction by owner.	3.98	1	3.72	2
Some information/instruction is not kept in writing.	3.76	2	3.84	1
Ineffective record-keeping system.	3.52	3	3.69	3
Inaccurate recorded information.	3.46	4	3.63	4
Inaccessibility of documents when needed.	3.38	5	3.53	6
Overdue in retrieving the needed document.	3.15	6	3.57	5
No standard form used to record the data during construction.	3.08	7	3.41	7
No computerized documentation system.	2.94	8	3.14	8
High cost associated with retrieving required information.	2.59	9	2.78	9

According to contractors and consultants, the most severe problems faced in this stage are: (1) verbal instructions by the owner, (2) some information/instruction is not kept in writing, and (3) the ineffective record-keeping system. To avoid such problems, the contractors shall push to get a written instruction from the owner. This would, as such, provide a solid evidence when filing a claim. Additionally, it is emphasized that the adoption of a systematic documentation system is a must to facilitate the preparation and management of claims.

e. Presentation

When the dossier of the claim is ready, it shall be presented to the owner for assessment. The presentation of documents is a key factor for the success of claims. Although this stage is usually perceived as straight-forward, given the previous stages were properly accomplished, several problems are still faced in this stage. These are shown in Table 9.

Table 9. Problems in Presentation of Claims (Bakhary et al. 2015)

Problems in Presentation of Claims	Contractors		Consultants	
	Mean score	Ranking	Mean score	Ranking
Inaccessibility of relevant documents to submit along with the claim.	3.15	1	3.71	1
Insufficient skilled staff in preparing a claim submission.	3.14	2	3.65	2
Poor communication in presenting a claim.	3.06	3	3.59	4
Insufficient time to thoroughly prepare claims due to high workload.	3.05	4	3.61	3
Ambiguous responsibility to the person that prepare the full report of claim presentation.	2.96	5	3.41	6
No standard format of a claim submission.	2.92	6	3.24	7
Ambiguous procedures in preparation of claim presentation.	2.85	7	3.47	5

According to contractors, the top identified problems are: (1) inaccessibility of relevant documents to submit along with the claim, (2) insufficient skilled staff in preparing a claim submission, and (3) poor communication in presenting a claim. In addition, consultants accentuated the fact that the “insufficient time to thoroughly prepare claims due to high workload” is also a core problem that shall be addressed. In fact, addressing the problems of the previous stages and mitigating their consequences leads to a better preparation of claims.

f. Negotiation

When it comes to claims resolution, negotiation is the first approach adopted. Brown and Marriott (1999) define negotiation as “a way in which individuals communicate with one another in order to arrange their affairs in commerce and everyday life, establish common grounds, and reconcile areas of disagreement”. As a matter of fact, it is informal, quick and simple in nature, which makes it the most cost-efficient dispute resolution method (Ren et al. 2003) as well as the most preferred one. Table 10 summarizes the problems faced in this stage.

Table 10. Problems in Negotiation of Claims (Bakhary et al. 2015)

Problems in Negotiation of Claims	Contractors		Consultants	
	Mean score	Ranking	Mean score	Ranking
Disagreement arising during negotiation.	3.72	1	4.02	1
Unsatisfactory evidence to convince other parties.	3.52	2	3.96	2
Poor negotiation skills.	3.29	3	3.55	3
Adversarial relationship with other parties.	3.12	4	3.49	4
Inadequate time due to high workload.	2.99	5	3.35	5
Difficult to settle without any litigation or Arbitration.	2.74	6	3.16	6

There was an agreement among contractors and consultants regarding the dilemmas that were perceived as most problematic. The three most problematic issues were (1) disagreement arising during negotiation, (2) unsatisfactory evidence to convince other parties, and (3) poor negotiation skills. To attain the most desirable negotiation outcomes, solving and mitigating the problems of preceding stages assures

the availability of solid evidence and boosts the clarity and infallibility of the claim's substantiated arguments in a manner crucial for a strong upper-hand position during the negotiation process. Moreover, negotiators shall be well trained to have better negotiation skills.

6. Underlying Mechanisms

When analyzing a claim filed by the contractor, the owner has to ask the following questions (Bubbers and Christian 1992, FIDIC 1999): Were the contract requirements met (Thomas et al. 1990)? Did the contractor refer to the proper contract's clauses? Does the consultant bear partial or full responsibility? Was the contractor able to predict the situation at the time the contract was signed? Were the specifications defective? Was the contract misinterpreted? If this was the case, which interpretation shall govern? Therefore, for better chances of success, contractors submitting claims shall (1) follow the mechanism set forth in the relevant contract conditions, (2) provide a detailed breakdown of the claimed entitlement, and (3) present all the documents needed to support the alleged claim (Abdul-Malak et al. 2002).

a. Two-step Approach vs. Multistep Approach

Traditionally, contracts implemented a two-step process to resolve disputes (Jessup and Jessup 1963). Under this process, the design professional first determines the eligibility of a contractor's claim and then recommends the owner to either approve or reject the

claim. Accordingly, if either the owner or the contractor is dissatisfied with the design professional's judgment, that party can refer the dispute to binding adjudication. This approach was adopted based on the fact that the construction industry members believed that the designer is the most suitable party to assess the validity of a proclaimed change based on the intent of his design (Stipanowich 1997). However, when exercising the quasi-adjudicatory role, the objectivity of the design professional is questioned due to conflict of interest (Cheeks 2003). As such, a multistep approach has evolved and was adopted, where mechanisms set forth in the contract conditions stipulate several steps such as engineer's determination, dispute adjudication board's decision, alternative dispute resolution, and finally arbitration (FIDIC 1999).

b. Standardized Mechanisms

Standard conditions have been gaining wider acceptance on the basis that they offer best practices for the allocation of risks between the contracting parties. The efficiency of their inherent mechanisms has been the focus of several recent studies. To this end, El-adaway et al (2013) examined the American Institute of Architects (AIA) conditions with the aim of highlighting the rights and responsibilities of the project participants named in the contract and the corresponding allocation of risks and generating guidelines for contract administrators working on projects adopting these conditions. Moreover, Fawzy and El-adaway (2012) studied the relevant provisions of conflicts, claims, disputes (including unforeseeable physical conditions), employer's risks, force

majeure, and delay damages of the World Bank contracts. The comprehensive contract administration guidelines laid out there in promoted efficient and effective management of World Bank contracts.

Comparative examinations have also been carried out on more specific provisions that are included under various national and international standard conditions, including those provisions related to change orders, extension of time, and payments. In the change order study, El-Adaway et al. (2016) studied the change order provisions to highlight similarities and differences among different standardized forms. The change order processes were actually compared with respect to the execution of the underlying mechanism, the power and authority of making a change order, and the corresponding adjustments to contract price and time. Similarly, Sayal and Bora (2016) studied change order clauses under the AIA, the Engineers Joint Contract Documents Committee (EJCDC), ConsensusDocs, and the Canadian Construction Documents Committee (CCDC)/Canadian Construction Association (CCA). Their study highlighted the inconsistency in guidelines used to price change orders and identified direct and indirect cost categories that are typically used in pricing models (Syal and Bora 2016). In regard to the extension of time provision, El-Adaway et al. (2016) studied the extension of time clauses under EJCDC, AIA, ConsensusDocs, the World Bank, the International Federation of Consulting Engineers (FIDIC), the New Engineering Contract (NEC), and the Joint Contracts Tribunal (JCT) standard conditions. The objective of their study was to outline and illustrate the time extension process in an

attempt to visualize and properly administer the studied provisions. Furthermore, in a recent research effort by El-Adaway et al. (2017), various payment provisions from several investigated contracts were extracted and studied under EJCDC, AIA, ConsensusDocs, the World Bank, FIDIC, NEC, and JCT standard conditions. In this case, the corresponding underlying mechanisms were examined, and a comparative analysis was performed. More specifically, the authors extracted schematic timelines pertaining to the payment process in order to highlight the stages with their time-bars and help contractors remedy the situation in case of delayed payments. Another recent study, by Abdul-Malak and Abdulhai (2017), focused on investigating the progression of claims and disputes and the evolution of their documentation along the staged resolution timeline of the FIDIC standard conditions for construction contracts (FIDIC 1999). In conclusion they pointed to the leading role of contract administrators and stressed its paramount responsibility in promptly reacting in strict observance of the clocks governing such a complex, gated process (Abdul-Malak and Abdulhai 2017).

7. Simulation

Claim mechanisms might be expeditious while others might involve unregulated periods thereby dragging the claims for a relatively longer period of time. Understanding the dramatic consequences of claims, especially in realistic scenarios as opposed to theoretical contemplations, dissuades contracting parties from piloting or experimenting with unverified mechanisms in actual construction projects. Therefore,

simulation can be utilized as a safer tool with a much lower risk profile for optimizing outcomes of construction claims and disputes by experimenting with various possibilities and easily controlling/calibrating the initial set of starting parameters. Hence, simulation, technically defined as a computer-aided tool that imitates the actual system in a virtual computerized model, was adopted in this thesis. A simulation model allows the understanding of system behavior, testing several alternatives, selecting optimal solutions, evaluating the impact of certain variables, as well as other functions (AbuRizk 2010). Three simulation techniques could prove promising in simulating the aforementioned process, namely: (1) discrete-event simulation (DES), (2) system dynamics (SD), and (3) agent-based modeling (ABM) (Maidstone 2012).

a. Discrete-Event Simulation

DES is one of the most popular simulation techniques used to model a process (Maidstone 2012). This technique adopts the top-down modeling approach whereby it focuses on modeling in detail a system and not entities. Furthermore, the entities flowing through the process are passive and they cannot act independently since their behavior is affected by that of the system.

b. System Dynamics

SD is another popular simulation technique used to model a system. Similar to DES, a top-down modeling approach is adopted, but the system is modeled as a series of tanks

or stocks (i.e. rectangular shapes) connected by pipes or flows (i.e. arrows), and entities are viewed as a continuous quantity flowing through this system. The rates of flow are controlled by valves, and accordingly the time spent in each stock or system state is modelled by fixing the rates of inflow and outflow (Brailsford and Hilton 2001).

c. Agent-Based Modeling

Among the available simulation techniques, agent-based modeling is the method used to simulate the progression of claims.

Agent-based model (ABM) is a simulation technique that simulates agents in an environment to study their behavior and interactions with other agents. In contrast to other simulation techniques, ABM does not describe the global phenomenon of the system. This phenomenon is, rather, generated from the actions and interactions of agents. To develop an ABM model, three steps must be fulfilled. First, the set of agents shall be defined. In this regard, it shall be noted that anything can be modeled as an agent and not only people. Then, the set of rules, regulating the interactions of agents among themselves and with the shared environment, shall be determined. Finally, the environment shall be modeled (Klugl and Bazzan 2012).

ABM, also known as multi-agent systems (MAS), has been used a lot in in construction research. Liang et al. (2016) did an extensive literature review to investigate the various applications of ABM in fields of design, construction and operation. Results are summarized in Table 11.

Table 11. Application of ABM in The Construction Field (Liang et al. 2016)

Phases	Applications	Topics	References
Design	Decision support system	Agent based model for collaborative design	Anumba et al. (2003), Anumba et al. (2002), Du and El-Gafy (2012), Ren et al. (2011a, b), Wang et al. (2010), and Xue and Ren (2009)
	Evaluation and demand analysis	Analysis of stakeholders and Andrews et al. (their demand)	Andrews et al. (2011), Azar and Menassa (2010, 2012), Kashif et al. (2011), Koo et al. (2012), and Zhang et al. (2010)
Construction	Computer aided design	Collaborative 3D design model	Chu et al. (2009)
	Procurement management	Agent based software for supply chain	Fox et al. (2000), Jiao et al. (2006), Kwon et al. (2011), and Ng and Li (2006)
		Agent based modeling and simulation	Min and Bjornsson (2008), Soroor et al. (2012), and Tah (2005)
	Negotiation	Framework for MAS negotiation	Xue et al. (2005)
		Simulation and platform of negotiation	Dzeng and Lin (2004), Luo et al. (2002), Ren et al. (2002, 2003a, b, c), Unsal and Taylor (2011), Xue and Ren (2009), and Xue et al. (2009)
Scheduling	Integration of the schedules from various participants Adaptation to the dynamic environment	Christodoulou (2009), and Watkins et al. (2009)	
Operation	Dispute resolution	Methods in claim and compensatory	Christodoulou (2009), Interrante and Rochowiak (1994), Kim and Paulson (2003), Kim et al. (2003), Molinero and Nunez (2011), and Ouelhadj and Petrovic (2009)
		Simulation of construction site	El-Adaway and Kandil (2010), Kim and Paulson (2003), Kim et al. (2003), and Ren et al. (2002, 2003a, b, c)
	Site management	Simulation of construction site	Aziz et al. (2006), Du and El-Gafy (2012), Kim and Kim (2010a, b), Lee and Bemold (2008), and Watkins et al. (2009)
Others	Maintenance	Materials and facilities management	Bernhardt and McNeil (2008), Osman (2012), and Shen et al. (2012)
	Knowledge management Education	Information and knowledge management Virtual coach and education	El-Diraby and Zhang (2006), and Obonyo (2013) Rojas and Mukherjee (2006)

Models associated with dispute resolution applications are outlined below.

i. MASCOT Model

Ren et al. (2002, 2003a, b, c) developed a multi-agent system for construction claim negotiation (MASCOT). The development of this model involved four stages: (1) reviewing negotiation theories and models required to define the interactions of agents within, (2) examining the nature and characteristics of claims negotiation to identify system requirements, (3) studying MAS, and (4) developing, implementing, and

evaluating the construction claim negotiation model. Figure 4 illustrates the MASCOT process model.

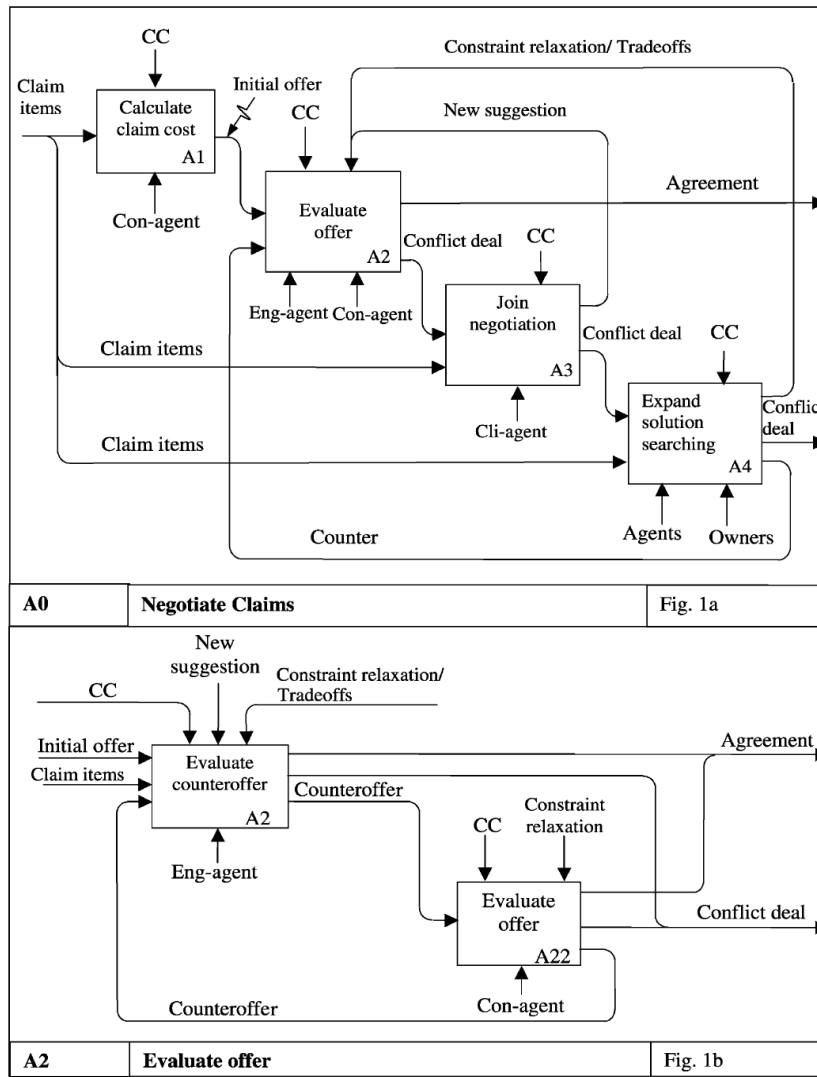


Figure 4. MASCOT Process Model (Ren et al. 2003)

Using the MASCOT model, Ren et al. (2002, 2003a, b, c) were able to study the impact of various negotiation approaches on the conduct and outcome of construction claims negotiations.

ii. MAS-COR Model

In a common law system, attorney and judges refer to previous disputes to reason analogically. Therefore, the presence of an automated system, that can generate legal arguments in new disputes based on the facts and outcomes of previous ones, would be significantly beneficial for the construction industry. As such, El-adaway and Kandil (2009) developed a multi-agent system for construction dispute resolution (MAS-COR) that simulates the “process of legal discourse in construction disputes using adversarial precedent law”. The MAS-COR model is illustrated in Figure 5. The developed model is a valuable decision support tool that lessens the time and effort needed to prepare the defense of construction claims and disputes.

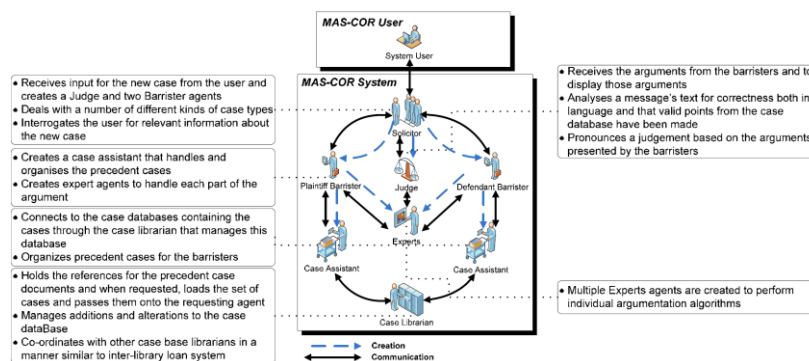


Figure 5. MAS-COR Model (El-adaway and Kandil 2009)

CHAPTER III

RESEARCH MOTIVATION, OBJECTIVES, AND CONTRIBUTIONS

A. Research Statement and Motivation

The conditions of contracts specify the mechanisms to be followed throughout the execution of the contract's works. Among various researched contractual provisions, claims/disputes administration mechanisms tend to receive considerable attention, as claims are becoming an indispensable part of the construction contract system (Vidogah and Ndekugri 1997). The encountering of claims is reported to be inevitable (Bradley and Langford 1987), and their extensive recurrence on construction projects has been clearly confirmed (Pinnell 1998, Abdul-Malak et al. 2002). Therefore, contract administrators need to be vastly knowledgeable about contemporary, multistep claims/dispute processes, in order to be able to fulfill the stringent requirements of the various gated stages/phases involved (Abdul-Malak and Abdulhai 2017).

In fact, such multistep processes have been devised under different national and international standard conditions for the construction contract, including those by the American Institute of Architects (AIA), the Engineers Joint Contract Documents Committee (EJCDC), the ConsensusDocs, the International Federation of Consulting Engineers (FIDIC), the New Engineering Contract (NEC), and the Joint Contracts

Tribunal (JCT). Available standard conditions offer a variety of timeline spectrums along which the resolution of such claims and disputes can be pursued. In fact, contract conditions governing the administration of construction claims and disputes play a critical role, and their underlying resolution mechanisms are expected to be efficient and expeditious to counteract detrimental repercussions of unresolved claims on the progress of the project and the relationship among contracting parties. However, none of the previous research efforts has designed a framework to measure the efficiency of a certain claim/dispute mechanism or has derived an optimal claim/dispute mechanism to expeditiously or better resolve claims.

B. Research Questions

Upon reviewing the literature and examining the standard conditions of construction contracts, several research questions are presented, and the aim to systematically uncover their answers is core to this study. The research questions presented below follow the SMART principle:

- **Specific:** the questions must be specific to the studied topic and its corresponding objectives
- **Measurable (Assessable):** the answers of the questions must be either quantitative or qualitative with the possibility of being assessed using certain methods and means

- **Achievable:** the required resources must be accessible, and researchers should be able to answer the questions
- **Realistic:** the questions should be directly related to the studied topic and should accurately address the scope of the questions
- **Time-specific:** the proposed questions should be met within the timeframe adopted

Accordingly, the research questions addressed are:

1. What are the mechanisms that expedite the process of resolving claims versus those that hinder it?
2. What is the most suitable mechanism for the owner to adopt versus the one that is most favorable to the contractor?
3. What best practices must the engineering professional follow upon exercising different judgment-rendering roles under various standard mechanisms?
4. What are the variables that should be used to assess the effectiveness of the examined mechanisms?
5. What is the impact of the adopted mechanism and the behavior and interaction of the involved parties on the progression of construction claims?

C. Research Goals and Contributions

It goes without saying that regulating the process by following claim provisions within the conditions of standard contract types, such as AIA, EJCDC, ConsensusDocs, FIDIC, NEC, and JCT, is an acceptable first-step initiative in the direction of resolving arising

conflicts. However, the underlying mechanisms have different stages, sequencing, time-bars, and properties. Therefore, the adoption of a certain contract type for conflict resolution might not always provide optimal outcomes in varying scenarios and circumstances. Therefore, the conducted research aims to:

1. Explore the spectrum of the standardized claim/dispute mechanisms
2. Make the owner and the contractor aware of the differences among standardized mechanisms to help them choose the most suitable one
3. Expose the engineering professionals to the different judgment roles that may be exercised and the relevant best-practices
4. Enable the contractual parties to test the impact of the adopted mechanism prior to its actual implementation with the possibility of introducing parametrical changes accordingly to improve the effectiveness of the process
5. Propose the optimal claim/dispute mechanism

In addition to achieving these goals, this research tests the following hypothesis: “The optimal mechanism that should be adopted to resolve claims is not a mechanism implemented by one of the standard conditions of construction contracts but is rather a combination of sub-modules of the underlying mechanisms.”

The outcomes of the research include:

1. A comprehensive understanding of the spectrum of claim/dispute mechanisms adopted by the aforementioned standard conditions. This entails highlighting the mechanisms that expedite the resolution process in contrast with those that

hinder it and pinpointing their differences to aid contracting parties in adopting the most suitable one.

2. An overview of the spectrum of judgment-rendering roles and the general principles that engineering professionals must abide with when rendering judgments.
3. The development of a generic timeline that covers all options that can be possibly applied within each of its modules.
4. The design of an agent-based model to simulate the interaction among the involved parties as claims progress/mature and visualize various scenarios.
5. The design of an optimal claim/dispute framework that can expeditiously and effectively resolve claims in order to enhance the performance of the construction projects and maintain a healthy relationship among the contracting parties.

CHAPTER IV

METHODOLOGY

The methodology presented in Figure 6 consists of three phases and seven modules. Phase 1 starts by drawing standardized generic timelines from each standard condition. Phase 2 encompasses the (a) development of detailed frameworks depicting various scenarios, (b) the pinpointing of all judgment-rendering roles exercised within each of the examined standardized mechanisms, (c) a comparison of respective standardized mechanisms, and (d) a formulation of one generic timeline. Finally, Phase 3 (a) assesses the dynamics of the examined mechanisms through simulation, and (b) deduces the optimal mechanism.

A. Phase 1: Standardized Global Timelines

In this study, the AIA, ConsensusDocs, EJCDC, FIDIC, JCT, and NEC standard conditions and their claim/dispute provisions were meticulously examined to formulate standardized global timelines and draw the underlying mechanisms and respective stage properties.

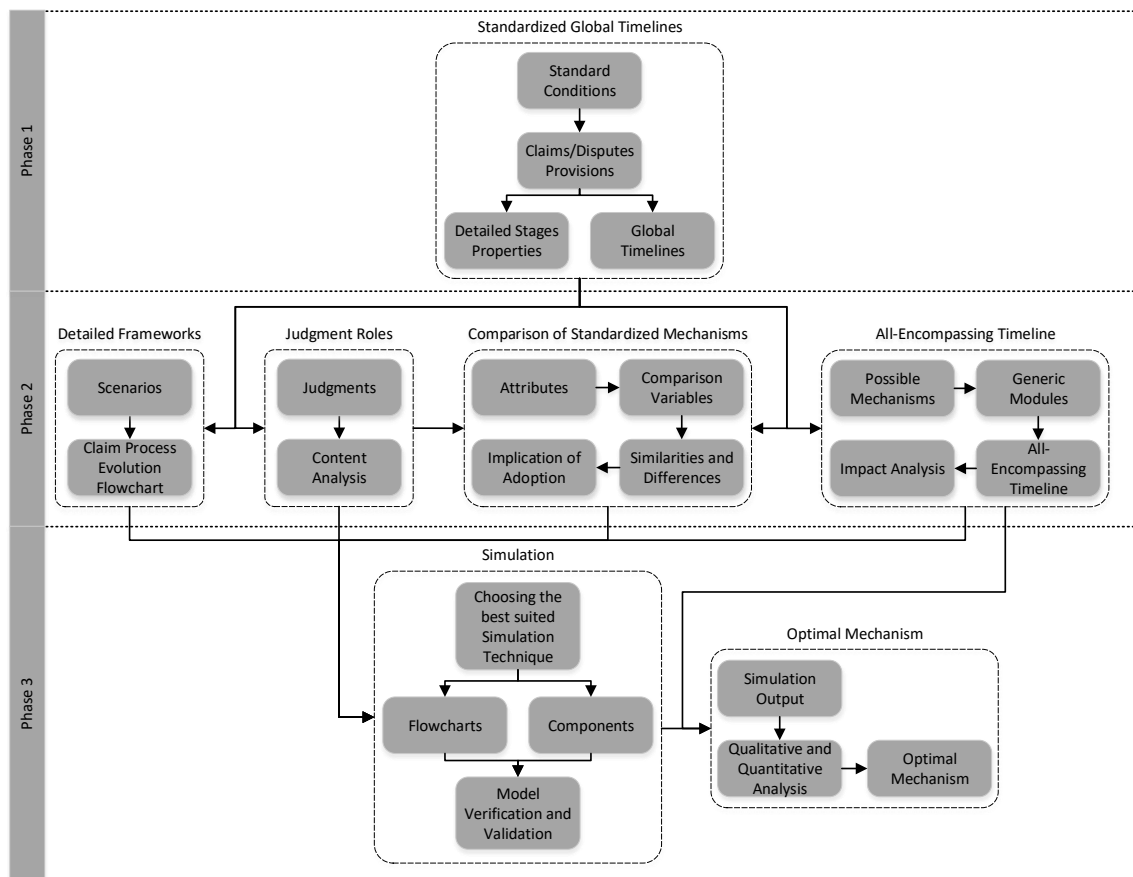


Figure 6. Research Methodology

B. Phase 2

1. Detailed Frameworks

Within every stage of the examined mechanisms, several scenarios may take place and accordingly many possible actions and outcomes can exist. Therefore, this module illustrates all possible cases, within every standard condition that could be faced when resolving a claim. Based on the deduced scenarios, a comprehensive process flowchart

was formulated to incorporate all possibilities. This flowchart can act as a guiding map for practitioners throughout the claim evolution process.

2. Judgment Roles

As part of the underlying standardized mechanisms, the involvement of several engineering professionals is typically necessary for exercising judgment-rendering roles. However, these roles are fulfilled under different capacities. Therefore, this module addresses and describes all judgment-rendering roles that are exercised within the examined standardized mechanism. In addition, the judgments types and properties are also determined. This module performs an in-depth content analysis by discussing (1) the scales of independency and impartiality of the judgment roles and (2) the judgment rendering guiding principles.

3. Comparison of Standardized Mechanisms

This module conducts a comparative analysis of the examined standards to highlight the similarities and differences. Therefore, comparison variables were devised, and their attributes were extracted from the detailed properties identified in the first phase. Additionally, the analysis was conducted from both the owner's and the contractor's perspectives.

4. All-Encompassing Timeline

In an attempt to aid contractual parties and allow them to select a single timeline in lieu of any of the aforementioned standardized claim/dispute mechanisms, this module formulates an all-encompassing timeline consisting of several sub-modules. Within every module, all possibilities encountered within the underlying mechanisms are incorporated. Consequently, a comprehensive mechanism is generated. This can be utilized as a point of reference for contracting parties to check alternatives that are implemented in other standards. Finally, an impact analysis is conducted to study the effects of implementing every possibility within the sub-modules.

C. Phase 3

1. Simulation

The dynamics of the examined mechanisms can be established either by resorting to historical case studies or implementing simulation techniques. For practical purposes, this study follows the simulation approach thus reenacting actual world-life problems in a virtual world. To fulfill this process, several steps shall be taken.

Firstly, the scope of work must be defined, and is, in this case, regarded as the progression of construction claims. Secondly, the most applicable simulation technique shall be determined for optimum outcomes. As previously established, the simulation of any problem will have to follow one of the following simulation methods: discrete event simulation, system dynamics, or agent-based modeling. Thirdly, both parts of the

problem shall be modeled: (1) the claim evolution process and (2) the corresponding actions of the involved parties. In fact, the evolution of claims depends on actions taken by the corresponding involved parties; hence, there is a need to model both the mechanism and the interaction of contractual parties. In this case, the flowcharts obtained from the detailed frameworks module of Phase 2 were modeled together with the interaction of the involved parties. Finally, the model's parameters and variables were added. Once the model and all steps are completed, model verification and validation are performed.

2. Optimal Mechanism

Within the all-encompassing timeline, numerous mechanisms can be formulated. However, one of these mechanisms is the optimal one capable of administering and resolving claims most efficiently. To determine this mechanism, the output of the simulation model was analyzed qualitatively and quantitatively.

CHAPTER V

PARTICULARIZED ANALYSIS OF STANDARDIZED MECHANISMS

A. Preamble

Delivering construction projects successfully, on time and within budget, serves the interests of both parties to the construction contract: the owner and the contractor. Critical to such desired success is the use of a well-prepared and drafted contract. The conditions of contracts specify the mechanisms to be followed throughout the execution of the contract's works. Among various addressed provisions and mechanisms, claims administration and dispute resolution tend to receive considerable attention, as claims are becoming an indispensable part of construction projects (Vidogah and Ndekugri 1997). The encountering of claims is reported to be inevitable (Bradley and Langford 1987), and their extensive recurrence on construction projects has been clearly confirmed (Pinnell 1998, Abdul-Malak et al. 2002). Therefore, contract administrators need to be knowledgeable about contemporary, multistep claims/dispute processes, to be able to fulfill the stringent requirements of the various gated stages/phases involved (Abdul-Malak and Abdulhai 2017). In fact, such multistep processes have been devised under different national and international standard conditions for the construction contract, including those by the American Institute of Architects (AIA), the

ConsensusDocs, the Engineers Joint Contract Documents Committee (EJCDC), the International Federation of Consulting Engineers (FIDIC), the New Engineering Contract (NEC), and the Joint Contracts Tribunal (JCT). As such, this chapter provides a particularized analysis of the aforementioned standardized claim/dispute resolution mechanisms.

B. AIA Claim/Dispute Resolution Mechanism

The reliance on standard conditions for the construction contract seems to continue to rise, and the interest in assessing the efficiencies of such conditions is likely to correspondingly increase. The work presented in this section is part of a comprehensive research study aiming at modelling the progression of claims and disputes along the timelines corresponding to six sets of standard contract conditions. As such, this section focuses on the claim/dispute mechanism that underlies the AIA's conditions pertaining to the administration of claims and disputes raised by either party during the course of construction. It aims at identifying the spectrum of scenarios that are likely to be encountered within the application of the AIA's prescribed claim/dispute process and developing a guide map that models the possible paths emanating from the underlying claim/dispute mechanism. The followed methodology involved (1) reviewing AIA A201 2017's "Article 15 Claims and Disputes" that prescribes the process adopted for administering and resolving claims and disputes (AIA 2017), (2) extracting the schematic timeline of the underlying mechanism and highlighting its main modules, (3)

summarizing the properties of each stage/module, and (4) developing all the scenarios that may possibly be encountered within each of the timeline's modules. A thorough analysis of the findings is then offered, addressing: (1) the initial decision maker's role, as compared to other initial-judgment roles prescribed under other national and standard contract conditions; (2) the expeditious properties of the involved process; (3) the road for reaching agreement through mediation; and (4) the path through the timeline thought of to represent the worst-case scenario that may possibly be encountered in reality. Finally, a comparison between the latest previous conditions and the newly released conditions was made to highlight the differences between their corresponding claims/disputes administration and resolution mechanisms.

1. Underlying Claim Mechanism

Conflicts arising between the contracting parties during the course of the construction contract adopting the AIA standard conditions shall be resolved pursuant to "Article 15 Claims and Disputes". A close inspection of the terms and requirements included under this article resulted in developing a schematic claim/dispute timeline along with a tabulated summary of the stages corresponding to the process inherent in these provisions, as shown in Figure 7 and Table 12, respectively.

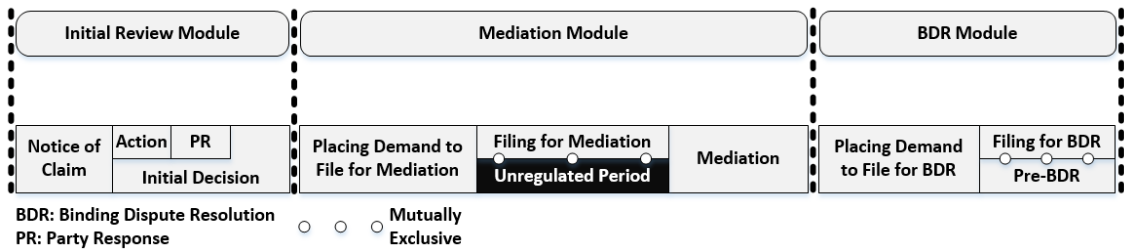


Figure 7. Extracted Schematic Claim/Dispute Timeline

To initiate a claim, the claimant, be it the owner or contractor, shall submit a notice of claim to the other party and to the initial decision maker. The initial decision maker is a third-party entity (or individual), named in the contract based on mutual agreement of the parties (AIA Document Commentary 2007). The role required of this initial decision maker is to give an initial decision in respect of matters contended as part of submitted claims. By default, the architect serves the role of this initial decision maker, unless the parties agree to name another third party. If the architect is not asked to act as the initial decision maker, he shall nevertheless be copied on the notice of claim issued by the claimant. Claims shall be initiated pursuant to § 15.1.3.1 upon the recognition of a condition or the occurrence of an event giving rise to the claim. An initial decision shall be given by the initial decision maker in regard of each raised claim. In case the condition giving rise to a claim is recognized after the expiry of the correction period of the works, the claim shall be submitted directly to the other party, and no decision by the initial decision maker shall then be required. Prior to rendering an initial decision, the initial decision maker shall review the claim and entertain taking

one or more of several actions that may potentially be warranted. For example, one of the possible actions is to request of the claimant to submit additional supporting data, which shall in turn be submitted pursuant to § 15.2.4. Following the fulfillment of these stages, the initial decision shall render an initial decision that is condition precedent to the triggering of the succeeding mediation phase of the timeline. Initial decisions rendered, pursuant to § 15.2.5, are born as final and binding with the possibility of being revoked upon invoking the mediation and, if failing to achieve agreement therein, binding dispute resolution phases. Mediation is invoked upon filing a request to mediation that could be either (a) filed directly by either party, or (b) filed as a result of one of the parties placing a demand for the other party to file for mediation. Placing such a demand shall cause the demanded party to file for mediation within the corresponding time window.

On the other hand, not placing such a demand does not preclude the possibility of filing for mediation, by either party, at any time. In either case, mediation will be initiated once the “request to mediation” is filed. Successful mediation results in reaching an agreement that is likely to be “enforced as a settlement agreement in any court having jurisdiction thereof”. Alternatively, ending mediation without achieving a settlement triggers the binding dispute resolution (BDR) procedures. Similar to the procedure used under the mediation stage, either party can place a demand for the other party to file for BDR, and to do so within a stipulated time bar. Placing this demand has

the effect of regulating the period that could be exhausted before the filing for BDR effectively takes place.

Table 12. Claim Process Stages

Stage	Time Bar (Days)	Triggered By	Parties Involved	Actions	Corresponding Clause
Notice of Claim	21	Event	Claimant: Contractor or Owner IDM: Initial Decision Maker	Initiating a claim by a written notice to other party and IDM, with a copy to architect if architect is not the IDM	15.1.3.1
Action	10	Receiving the notice of claim from claimant	IDM, Claimant & Other Party	Requesting additional supporting data from claimant, and/or Requesting a response with supporting data from the other party, and/or Rejecting the claim in whole or in part Approving the claim, and/or Suggesting a compromise, and/or Advising that IDM is unable to resolve the claim	15.2.2
Party Response	10	Receiving a request from IDM	Party Requested & IDM	Provide a response on the requested supporting data, or Advise IDM when response or supporting data will be furnished, or Advise IDM that no supporting data will be furnished	15.2.4
Initial Decision	30	Receiving the notice of claim from claimant, or Receiving of requested response	IDM, Claimant, Other Party	Rejecting the claim in whole or in part, or Approving the claim, or Advising that IDM is unable to resolve the claim	15.2.5
Placing Demand to File for Mediation	30	Rendering a decision by IDM	Claimant & Other Party	Demanding other party to file for mediation	15.2.6.1
Filing for Mediation	30	Placing demand for other party to file for mediation	Demanded Party: Claimant or Other Party	Filing a request for mediation within 30 days from the day the demand to file for mediation was made	15.2.6.1
Unregulated Period	Unregulated	Not placing a demand for other party to file for mediation	Party Triggering: Contractor or Owner Party Ending this Period: Contractor or Owner	Filing a request for mediation at any time	15.2.6
Mediation	60	Filing a request for mediation	Mediator, Claimant & Other Party	Endeavoring parties to resolve claim by mediation	15.3.2
Placing Demand to File for Binding Dispute Resolution	30	Conclusion of mediation	Demanded Party: Claimant or Other Party	Demanding other party to file for binding dispute resolution	15.3.3
Filing for Binding Dispute Resolution	60	Placing a demand for other party to file for binding dispute resolution	Demanded Party: Claimant or Other Party	Filing for binding dispute resolution within 60 days from the day the demand to file for binding dispute resolution was made	15.3.3
Pre-Binding Dispute Resolution	Statute of Limitations	Not placing a demand for other party to file for binding dispute resolution	Claimant, Other Party	Filing for binding dispute resolution by either party	15.4.1.1

2. Detailed Analysis

As illustrated in Figure 1, the schematic claim/dispute timeline can be divided into three modules: initial review, mediation, and binding dispute resolution. Particularized

scenarios applicable to each module were constructed in order to explore the claim/dispute progression possibilities likely to prevail in each.

a. Module A: Initial Review

The initial review module forms the first part of the claim/dispute process, spanning from the initiation of a claim to the rendering of an initial decision. Within this module, three scenarios were generated, as presented in Figure 2. In all scenarios, the notice of claim is submitted within twenty-one days from the day of occurrence of the event giving rise to the claim, pursuant to § 15.1.3.1. Instead of opting to take an (interim) action upon receiving the claim, as discussed above, the initial decision maker can directly render an initial decision, as shown in scenario A.1. § 15.2.5 specifies that the initial decision maker can either 1) approve or reject the claim in whole or in part, or 2) advise that he is unable to resolve the claim. Moreover, the initial decision has to be made in writing accompanied with the justifying reasons. Prior to rendering decisions, the initial decision maker may consult with both parties and/or receive help from owner's-maintained resources. The initial decision is condition precedent to the filing for mediation unless it is not rendered within 30 days from the day of receipt of the notice of claim (scenario A.2). Contrary to the two scenarios described above, scenario A.3 presents the case where the initial decision maker opts to first take an (interim) action prior to rendering a decision, as further explained below.

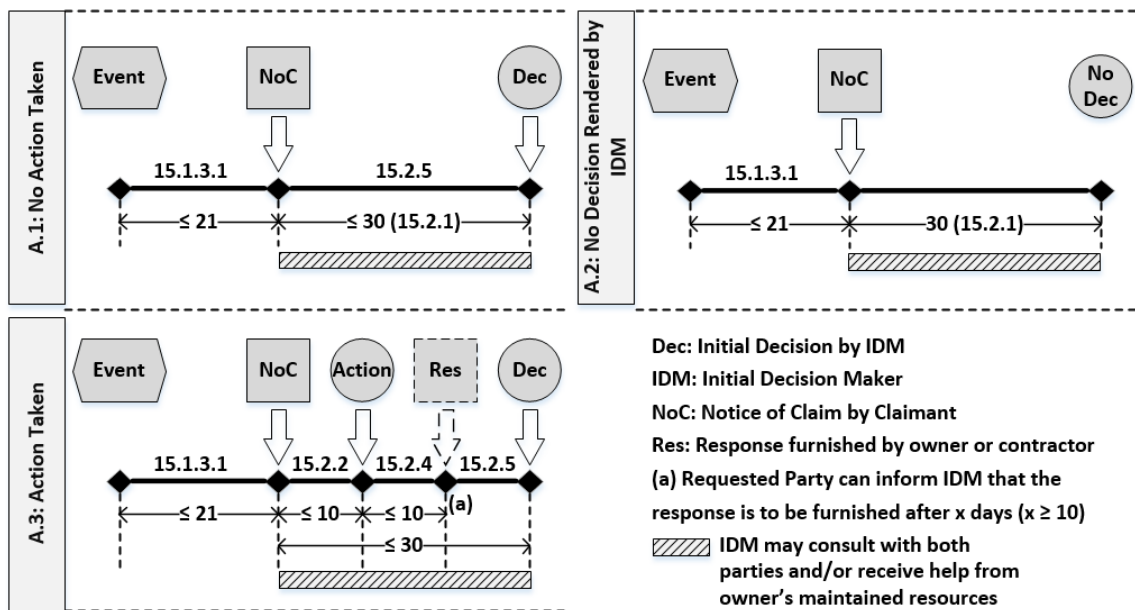


Figure 8. Initial review module

Figure 9 summarizes all the possibilities for actions that may be taken in preparation to the subsequent rendering of initial decisions. § 15.2.2 states that the initial decision maker can take one or more of the following actions within 10 days of the receipt of the claim notice: 1) request supporting data from the claimant (RSD); 2) request a response with supporting data from the other party (RR); 3) reject the claim in whole (RW); 4) reject the claim in part (RP); 5) approve the claim in whole (AW); 6) suggest a compromise (SC); 7) advise that the initial decision maker is unable to resolve the claim due to the lack of sufficient information (UR1); or 8) advise that it is inappropriate for the initial decision maker to resolve the claim (UR2). Although these actions are stated with seemingly equal chances of being taken, the order and likelihood

of their individual applicability are worth examining. To this end, the AIA Document Commentary states that the “notice of claim need not contain all information pertaining to the claim” (AIA Document Commentary 2007); in other words, the claimant does not have to furnish all information that supports the claim upon its initiation. Therefore, it is reasonable to expect the initial decision maker to first consider the possibility of taking the RSD and/or RR action(s). If any such request is made, the requested party shall within 10 days: 1) furnish additional supporting data, 2) notify the initial decision maker that the requested data will be furnished within “X” days, or 3) notify the initial decision maker that no additional data will be furnished.

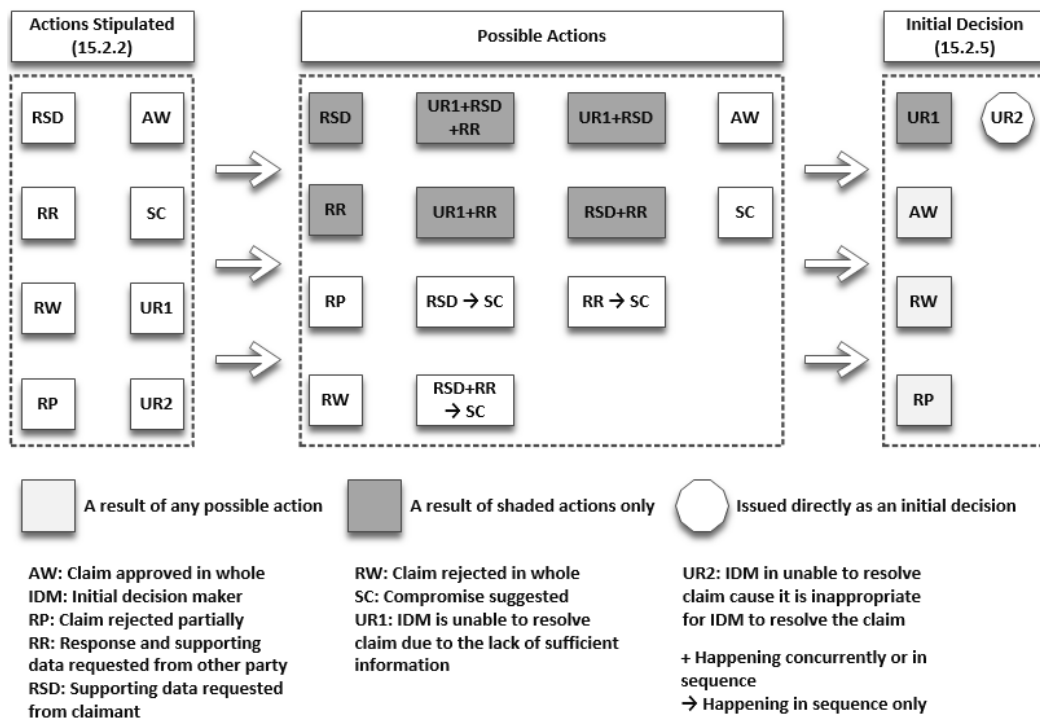


Figure 9. Possible actions taken versus initial decision rendered

On the other hand, actions including rejecting the claim in whole (RW), rejecting the claim partially (RP), accepting the claim in whole (AW), or suggesting a compromise (SC) may be taken only based on sufficiently furnished information, in order to enable deciding not only on the eligibility side (principle) of the claim but also on the claim's quantum. If initially submitted information is deemed insufficient, and the requested information has been furnished prior to the expiry of the first 10-day window, the initial decision maker may then take any of the RW, RP, AW, or SC actions, thereby ending in exercising two actions, in total, taken in sequence within this same first 10-day window. In other words, the likelihood of these actions to be taken by the initial decision maker during this window seems to be unlikely if the initially furnished claim information has been found insufficient to judge the merit of the case, thereby warranting requesting additional supporting data or response from the respective concerned parties. The aforementioned actions, RW, RP, AW, and SC, fall under the class of actions that seems to allow the initial decision maker to formulate his initial decision based on prior consultation with both parties. On the other hand, it seems impracticable to assume that the initial decision maker declares his inability to resolve the claim due to lack of sufficient information (UR1), for he has at his disposal the exercising of the RSD and/or RR option(s). Consequently, the UR1 action shall be accompanied with RSD and/or RR. Similarly, it is inappropriate for UR2 to be rendered as an action pursuant to § 15.2.2; that is, if, within the first 10 days, it is seen as

inappropriate for the initial decision maker to be the one to resolve the claim, this condition shall be expected to continue to prevail during the next period up to the end of the overall 30-day period. Therefore, it goes without saying that the UR2 option shall be rendered as an “initial decision” directly, pursuant to § 15.2.5, and not as an action under § 15.2.2. Besides, it shall be expected that such an initial UR2 decision to be given rather expeditiously, as it will be unprofessional to allow the full exhaustion of the 30-day period only to render such an inappropriateness-based decision.

Following the possible exercising of action(s) under § 15.2.2, as the case may warrant, the initial decision maker will still need to document his final opinion on the matter in the form of an initial decision, which he has to render pursuant to § 15.2.5. Although the initial decision maker can render AW, RW, RP, UR1, or UR2 as initial decisions, not all decisions are to be expected to be compatible with the actions (if any) already taken. For illustration, UR1 can be a rendered initial decision only in cases where the actions already taken are either “RSD and/or RR” or “UR1 followed by RSD and/or RR”. In those cases, the furnished supporting data and/or response, if any, are also deemed insufficient for the initial decision maker to render an initial decision. Consequently, the initial decision maker will not be able to resolve the claim. Moreover, when requesting supporting data and/or response by way of developing the ability to assess the eligibility as well as the quantum of the claim, it naturally follows that it will be appropriate for the initial decision maker to review the claim submitted. Thus, when any such action is taken pursuant to § 15.2.2, it cannot be followed by a UR2 decision

under § 15.2.5. On the other hand, any previously taken action may be followed with AW, RW, or RP being the basis of the opinion documented in the form of an initial decision, based on additionally provided supporting data and/or consultations that may have taken place with both parties.

b. Module B: Mediation

Whenever an initial decision is rendered, the claim moves to the mediation module where one of the scenarios presented in Figure 10 is to transpire. Following the issuance of such a decision, either party may file for mediation at any time. However, AIA conditions provide a mechanism to expedite the mediation process. Within 30 days from the date of rendering the initial decision, either party may place a demand for the other party to file for mediation. Once placed, the demanded party has 30 days to file a request for mediation. However, the failure of either party to trigger the expeditious mechanism keeps the window of filing for mediation unregulated.

In both cases, mediation is initiated once a request is filed, and the parties shall thereafter endeavor to reach agreement regarding the matter in dispute. If agreement is not reached or mediation is not concluded within 60 days from its initiation, either party may then place a demand for the other party to file for binding dispute resolution (BDR). Concluding mediation or placing a demand for the other party to file for BDR concludes scenario B.1, shown in Figure 4. Claims falling under scenario B.2 progress in a manner similar to that of scenario B.1, such that the party, filing for mediation, also

files for BDR concurrently with the filing for mediation or at any time within the mediation's period. In that case, the BDR process is stayed for a period of 60 days from the day on which mediation is initiated. Upon the agreement of both parties, or by a court order, the BDR process can be made to stay for a longer period. Unless agreement has been reached prior to the expiry of this period, the BDR process is then initiated. On the other hand, if a demand for the other party to file for mediation is placed, and no request is as such filed within 30 days, both parties then end up waiving their rights to pursue mediation or BDR (scenario B.3).

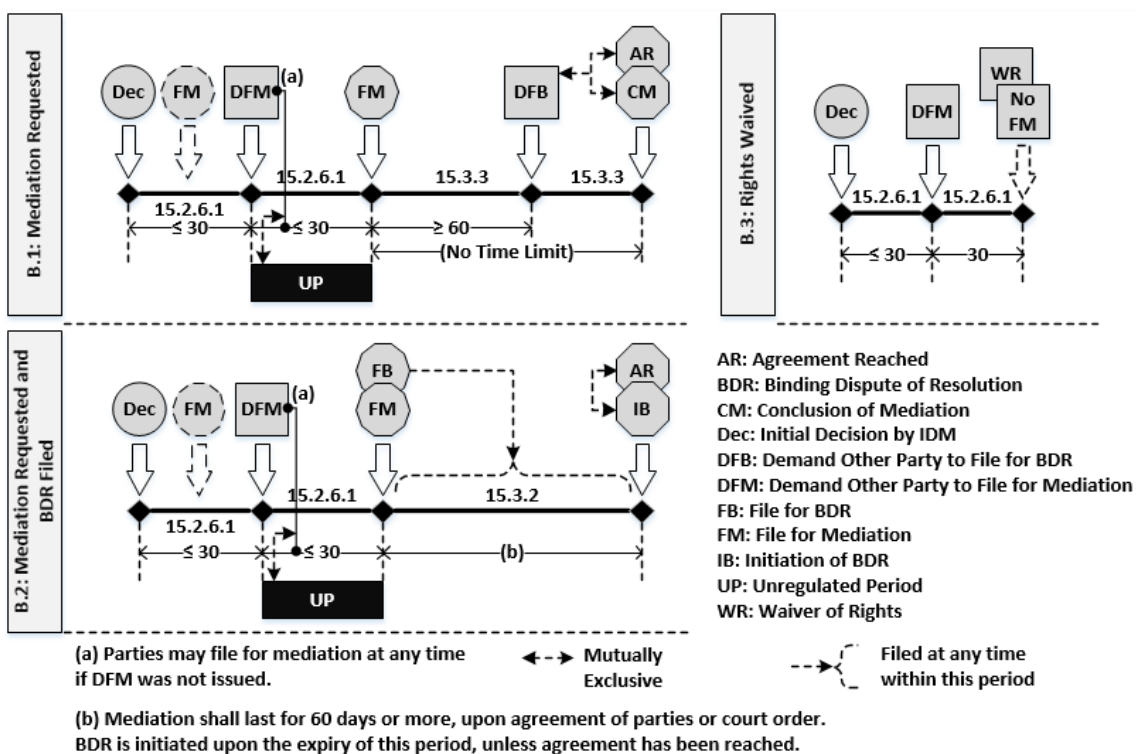


Figure 10. Mediation module with initial decision being rendered

As mentioned earlier, the initial decision is condition precedent to mediation, unless it is not rendered within the specified 30-day time bar. Consequently, the expiry of this 30-day period while giving no decision triggers the second set of scenarios of the mediation module, as presented in Figure 11. In the absence of an initial decision, the mechanism's inherently expeditious property no longer prevails. Either party can file for mediation at any time pursuant to § 15.2.6. Once a request for mediation is filed, scenario B.4 proceeds in a way similar to that of B.1, whereby mediation can end upon 1) reaching agreement, 2) being concluded by the mediator, or 3) placing a demand for the other party to file for BDR. Moreover, scenario B.5 resembles scenario B.2 in that BDR is filed concurrently with the filing for mediation or at any time within the mediation's period. Claims, progressing in accordance with scenario B.5, can be resolved either upon reaching agreement through mediation or referral to BDR.

In summary, claims exit the mediation module in four different ways: 1) reaching agreement through mediation, 2) initiation of BDR directly, 3) conclusion of mediation with no agreement reached, or 4) placing a demand for the other party to file for BDR. Exiting through "exit 1" ends the claim/dispute process, while exiting through "exit 2" has the effect of skipping the BDR module to initiate BDR directly. However, "exits 3 and 4" trigger the BDR module, in which disputes proceed as discussed in the next section.

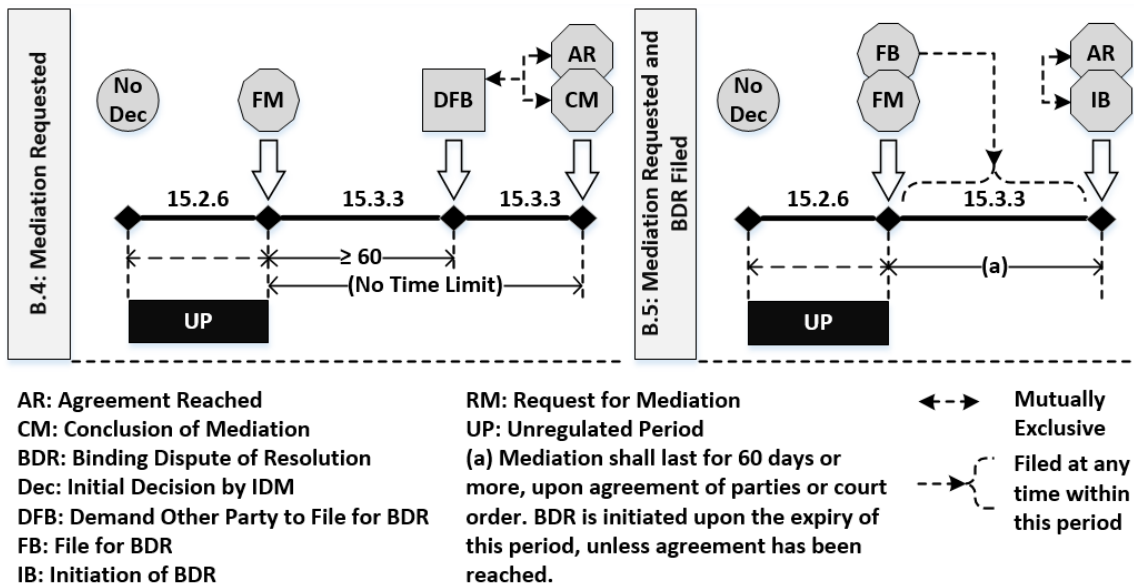


Figure 11. Mediation module with no initial decision being rendered

c. Module C: Binding Dispute Resolution

Claims reaching the BDR module proceed under one of the scenarios illustrated in Figure 12. Conclusion of mediation triggers a mechanism, similar to that used under the mediation module, which can expedite the BDR process. Either party may, within 30 days of conclusion of mediation, place a demand for the other party to file for BDR. Subsequently, the demanded party has a 60-day period to file for BDR. On the contrary, not placing this demand triggers the possibility of either party to file for BDR within such a time window as may be allowed by the statute of limitations of the governing laws, as depicted in scenario C.1. On the other hand, scenario C.3 shows the case of placing a demand for the other party to file for BDR, coupled with the failure of the other party to file for BDR within the prescribed period. Consequently, both parties

waive their rights to pursuing BDR at any later time. Alternatively, if the mediation module has ended with a demand for the other party to file for BDR, the demanded party then has 60 days to file for BDR (scenario C.2); else, both parties waive their rights to pursuing BDR (scenario C.4).

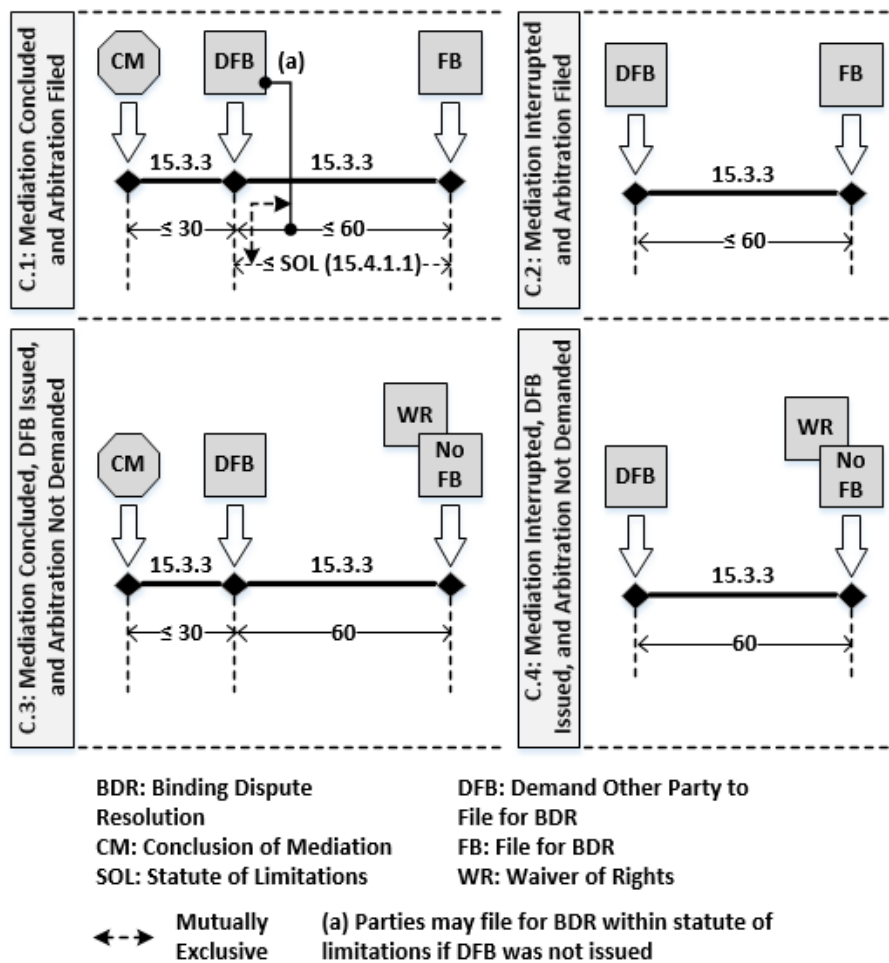


Figure 12. Binding dispute resolution module

3. Underlying Mechanism's Process Flowchart

In order to further help contract administrators and practitioners working on projects under the AIA standard conditions, a guide map that illustrates the overall claim/dispute process has been constructed, as shown in Figure 13. The presented flowchart summarizes all the scenarios encountered under the three modules discussed above.

Starting with the initiation of a claim, the submission of a notice of claim within 21 days moves the claim into the loop under the "IDM Action" stage. Within that loop, the claim can move to 1) the "Party Response" stage upon issuing an RSD and/or RR action(s), 2) the "Placing DFM" stage upon rendering a decision, or 3) the "Unregulated Period" stage upon the expiry of the stage's corresponding period. When moving to the "Party Response" stage, the claim will move back to the "IDM Action" stage upon the furnishing of additional data or notifying the initial decision maker that no additional data will be furnished. On the other hand, claims under at the "Placing DFM" stage can be shifted 1) to the "Unregulated Period" stage upon the expiry of the stipulated 30-day period or 2) to the "Mediation" stage upon filing a request for mediation. In cases where a demand for the other party to file for mediation has been placed (DFM), claims will be shifted to the "Mediation" stage upon filing for mediation. However, the elapsing of 30 days after placing a DFM shifts the claim to the "Waiver of Rights" endpoint.

Moreover, claims within the "Unregulated Period" stage stay there until either party file a request for mediation, thereby shifting the claim to the "Mediation" stage. Once entering the mediation's loop, claims can 1) reach the "Settlement enforced"

endpoint upon reaching agreement, 2) move to the “Placing DFB” stage upon concluding mediation, 3) enter the loop of filing for BDR upon placing a demand for the other party to file for BDR (DFB), or 4) reach the “BDR initiation” endpoint upon filing for BDR, but not earlier than filing for mediation.

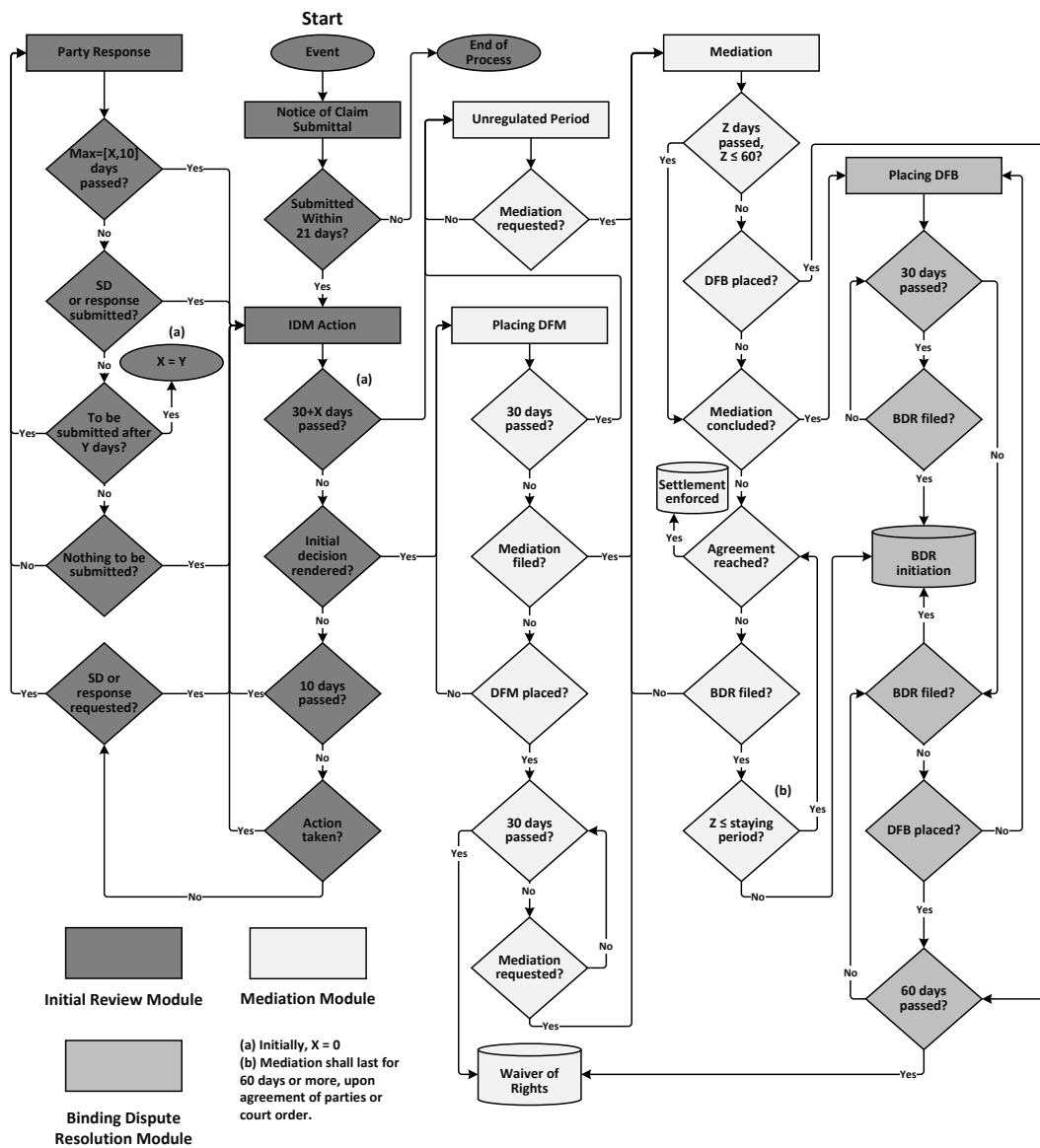


Figure 13. Practitioners' guide map

Claims under the “Placing DFB” stage enter the loop of filing for BDR upon placing a DFB. Conversely, the absence of a DFB allows claims to reach the “BDR initiation” endpoint at any time, upon filing for BDR. Finally, filing for BDR within 60 days cause claims within the loop of filing for BDR to reach the “BDR initiation” endpoint. Otherwise, claims reach the “Waiver of Rights” endpoint in the absence of filing for BDR.

4. Discussion

The above analysis revealed an array of possibilities along which the progression of claims/disputes may take place. This section highlights a number of observations pertaining to the role played by the initial decision maker and to other aspects and properties of the examined claim/dispute resolution process, which are worthy of drawing the attention of contract administration professionals to.

a. Initial Decision Maker

The role exercised by the initial decision maker can be seen as comparable to that of the engineer under the FIDIC standard conditions for the construction contract (FIDIC 1999). In fact, both roles represent the first-judgment role exercised for the purpose of rendering an initial opinion in regard to submitted claims. These roles can be compared based on the decision maker’s capacity and duty and the property of judgment expected of him. Firstly, the initial decision maker under the AIA conditions shall not show

partiality to either party when exercising its role. However, the ability to act impartially could be questioned when the architect, an entity appointed by the owner only, happens to be serving as the initial decision maker. On other hand, the engineer under the FIDIC conditions is considered to be part of the owner's personnel, and he as such is not required to act impartially (FIDIC 1999). Secondly, the FIDIC engineer is under an obligation to consult with each party in endeavoring to reach agreement, failing of which would demand a determination of him (FIDIC 1999), whereas the AIA initial decision maker may, but shall not be obliged to, consult with either party before rendering an initial decision. Thirdly, this initial decision, under the AIA conditions, is born as final and binding with a possibility of being revoked upon invoking mediation. In the FIDIC conditions case, if no agreement is reached upon carrying out consultations, the engineer has to render a determination that is born as binding but with no possibility of turning final (FIDIC 1999). Finally, it shall be noted that no similar roles exist under the EJCDC or ConsensusDocs conditions, under which the claimant communicates concerning a raised claim with the other party directly (EJCDC 2013, ConsensusDocs 2017).

b. The Expeditious Mechanism

A major highlight of the AIA conditions, as opposed to other standard conditions, is one that allows the triggering of an expeditious mechanism at the levels of the mediation and binding dispute resolution modules. That is, both parties are afforded the chance to

demand the other party to file for mediation or binding dispute resolution. This mechanism causes the other party either 1) to file a request within a definite period of time (30 days) or 2) to waive the rights of both parties to pursue mediation or binding dispute resolution. The implementation of these mechanisms has the clear effect of expediting the process and regulating it in a way that does not allow things to drag. Consequently, if a party is satisfied with the initial decision maker's decision and wishes to close the case expeditiously, that party can readily place the specified demand, thereby effectuating a quicker decision on the part of the other party in respect of either accepting the resolution offered in the initial decision or moving the claim forward to the succeeding mediation phase. A similar efficient process can be initiated by either party at the juncture between the mediation and binding dispute resolution phases.

c. Mediation Process

Under the AIA conditions, the prescription of "mediation" is explicit and made obligatory before the parties possibly electing to move the dispute forward to the BDR phase. On the other hand, the FIDIC conditions stay the commencement of arbitration for a period of 55 days, during which the parties may attempt to amicably settle the dispute on hand (FIDIC 1999). Several alternative dispute resolution (ADR) techniques may, at the discretion of the parties, be adopted for attempting such a resolution, including direct negotiation or a third-party assisted ADR method such as facilitation,

conciliation, or mediation. Moreover, parties under the ConsensusDocs conditions have the option of referring the claim to mitigation rather than to mediation (ConsensusDocs 2017), whereas mediation under the EJCDC conditions is initiated upon the mutual agreement of both parties (EJCDC 2013). Therefore, it can be clearly deduced that, although all the afore-mentioned standard conditions integrate, whether directly or indirectly, the mediation process within the claim/dispute mechanism, the AIA ones allow the process to be initiated unilaterally by either party, a property that is likely to secure a faster progression of the claim/dispute along the resolution timeline.

d. The Dragging Effect

Although the AIA's underlying claim administration process embodies steps that can be used to expeditiously close the case or allow it to move forward to the subsequent phases. However, there are circumstances that may cause a slower claim progression, possibly dragging its resolution over a rather undesirably long period. Nevertheless, this could not be as problematic as compared to the case of not having a binding initial decision rendered, as further explained below.

Figure 14 shows a hypothetical scenario under which the initial review module is concluded with 1) no decision having been rendered, 2) claim being rejected in whole, or 3) the initial decision maker advising that he is unable to resolve the claim. In all cases, the claimant ends up not having on hand a binding decision that could be implemented in the interim to partially reimburse him for the additional costs incurred

and/or to extend the time for completion of the construction contract, in order – in turn – to avoid having liquidated damages levied by the owner. Consequently, the claimant may opt to file a request for mediation as an attempt to reach a settlement. If it is in the other party’s interest to keep things dragging, the other party may not cooperate causing mediation to be concluded. Eventually, the claimant may file for binding dispute resolution to get a final and binding judgement. However, it may not be regarded as being feasible to initiate mediation and/or binding dispute resolution for every claim arising. As a result, this worst-case scenario can practically be viewed to stand a high likelihood of causing claims to pile up within the unregulated period, prior to – at a later stage in the construction period or even beyond it – filing a request for mediation.

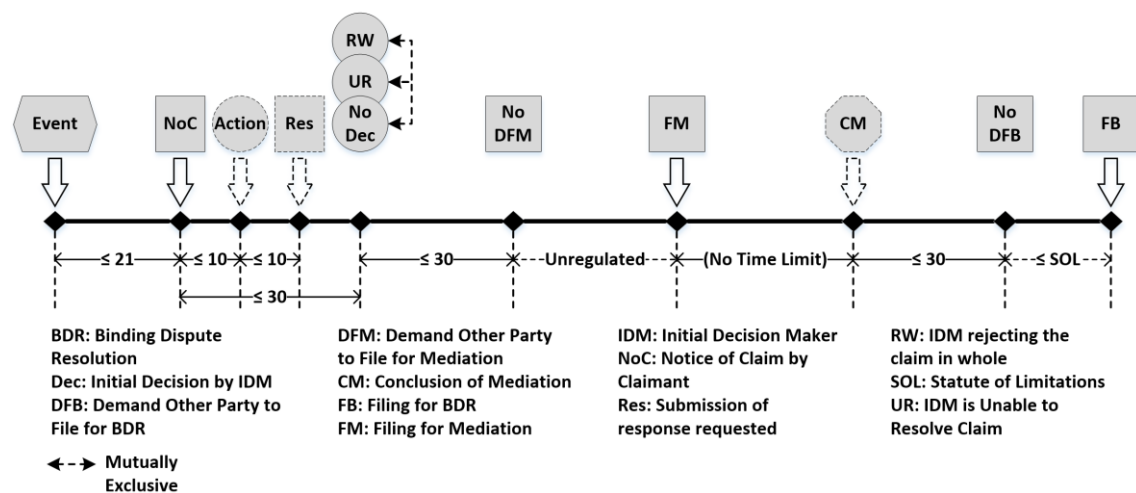


Figure 14. Worst-case scenario

e. AIA Conditions 2007 vs. AIA Conditions 2017

Upon the release of the new edition of the AIA standard conditions, a comparison with the latest previous edition revealed that two major changes were introduced along the underlying claim/dispute resolution process. As such, Figures 15 and 16 show these respective differences that were found to be related to the mediation and binding dispute resolution modules. In the case where a demand is placed for the other party to file for mediation, the demanded party used to be allotted 60 days from the rendering of the initial decision to file for mediation, as per the latest previous conditions (AIA 2007). As shown in Figure 9, the 30 days assigned for placing a DFM are nested within the 60 days that are available for the demanded party to file for mediation. Consequently, this stage can drag up to a maximum of sixty days. However, the 2017 version of the conditions adjusted this mechanism to have sequential time-bars governing the placing of a DFM and filing for mediation. To expedite the process, the DFM can be placed by the concerned party directly after the decision has been rendered, while the demanded party may consume all the shortened period of 30 days prior to filing for mediation. As a result, the overall expedited duration for having mediation filed for may go up to slightly above 30 days, as opposed to 60 days in the 2007 edition.

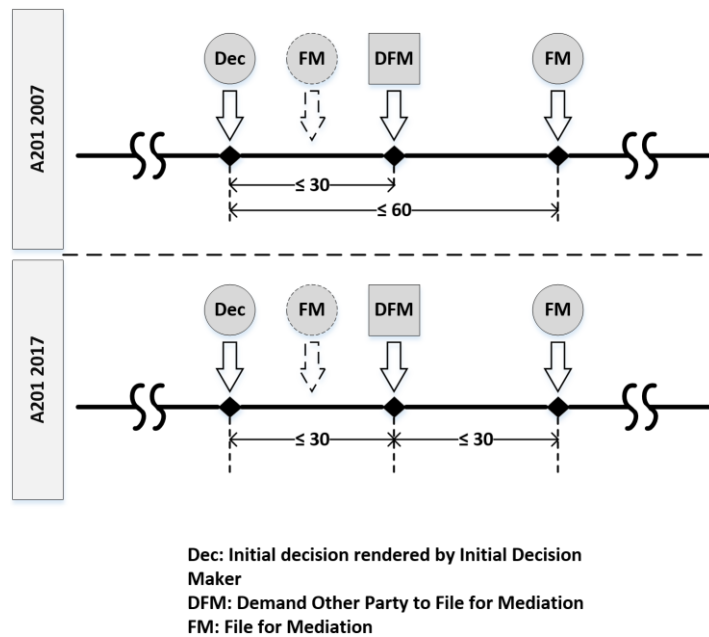


Figure 15. Mediation’s mechanism: AIA 2007 vs. AIA 2017

From another dimension, the major modification presented in the newly released edition was the introduction of an expeditious binding dispute resolution mechanism, as shown in Figure 10. Previously, both parties were able to file for binding dispute resolution within such a period as it may be allowed by the statute of limitations of the laws governing the contract. However, the new edition now allows either party, within 30 days from the conclusion of mediation, to place a demand for the other party to file for binding dispute resolution, a process that is similar to that prescribed in connection with the mediation module.

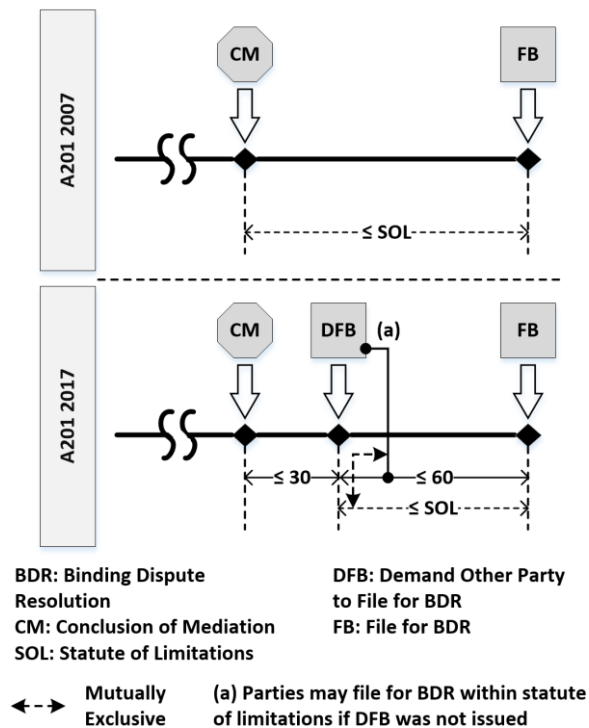


Figure 16. Binding dispute resolution’s mechanism: AIA 2007 vs. AIA 2017

In effect, under this new mechanism, the statute of limitations window can be closed, by allowing either party to force the other party to select between moving expeditiously (within 60 days) into the binding dispute resolution process, on the one hand, and accepting to waive its right for pursuing such a process at any later time, on the other hand. Whether such waiver eventually takes place or not depends on the laws under which the contract is to be construed or interpreted. Yet, this newly introduced mechanism can be realistically viewed, from a contract administration perspective, as a further enabler of the expeditious property of the AIA standard conditions, as it has been argued for in this paper.

5. Summary and Conclusions

The work presented in this section focused on examining the efficiency with which claims and disputes progress along the AIA's underlying resolution mechanism. The performed particularized analysis, pertaining to each of the three modules found to constitute the overall resolution timeline, revealed numerous possibilities of progression paths. These were synthesized in such a way that guides the contract administration professionals in understanding the steps involved and potentially tracking the claims/disputes statuses throughout their administration process. A number of conclusions have been made, as follows:

- The content analysis pertaining to the actions that are supposed to be taken by the initial decision maker, pursuant to § 15.2.2, exposed a number of different scenarios, under which any one or more of the prescribed action(s) may be taken within 10 days from the date of receipt of the claim notice. It is believed that the clarity in this said section can be improved; this can be done through synchronizing (or coordinating) these prescribed actions, and their intents, with what it entails to have the initial decision rendered pursuant to § 15.2.5.
- The ability of the decision maker to give an initial decision was found to be critical, as in the absence of such a decision there will be no binding reference (be it time and/or money) to rely upon, or to get a relief from, until agreement is

achieved through mediation or the dispute finally settled through the BDR phase.

- The process' proclaimed expeditious property is highly tied to the discretion available to either party to unilaterally trigger the mediation and BDR mechanisms. This expeditiousness has been enhanced by (a) removing the nesting of the time bars (under AIA 2007) pertaining to requesting the other party to file for mediation and the filing of request for mediation by this demanded party and (b) introducing a mechanism, similar to that of the mediation module, allowing the unilateral triggering of the BDR module, despite stipulating a longer period (60 days) within which the demanded party is to file for BDR.
- This constructed worst-case scenario showed the likelihood of claims to pile up within an unregulated period prior to the filing of a request for mediation. Such filing stands the chance of taking place at a late stage into the construction period, or even beyond it, owing to unreasonableness of initiating mediation and/or binding dispute resolution with every arisen claim.

C. ConsensusDocs Claim/Dispute Resolution Mechanism

The work presented in this section aims at exploring the underlying claim/dispute resolution mechanism offered by the ConsensusDocs standard conditions. The studied mechanism is the one used by the contracting parties to administer claims and disputes

raised by the contractor during the course of the construction project. The adopted methodology involves (1) examining ConsensusDocs 2018's "§ 8.4 Changes Notice" and "Article 12 Dispute Mitigation and Resolution" that prescribe the claim and dispute administration and resolution process (ConsensusDocs 2018), (2) extracting the corresponding schematic timeline, (3) developing all the scenarios that could possibly occur within each module, and (4) formulating an all-encompassing flowchart that holds all the possible paths emerging from the underlying mechanism. Finally, a thorough analysis is presented to address the subject of 'first discussions', as it plays a crucial role that affects the progression of claims and their potential outcomes.

1. Underlying Claim/Dispute Mechanism

The contracting parties of the construction project that adopt the ConsensusDocs standard conditions shall resolve arising conflicts pursuant to "§ 8.4 Changes Notice". If the conflict was not resolved successfully and required escalation to a dispute level, the parties shall refer to "Article 12 Dispute Mitigation and Resolution" to endeavor reaching a resolution. The schematic timeline of underlying claim/dispute resolution mechanism is shown in Figure 17.

The schematic timeline is divided into three modules: (1) initial review, (2) direct discussions, and (3) mitigation/mediation. The initial review module embraces the disclosure of claim and the corresponding initial judgment rendered. The direct discussions module entails multistep discussions that are conducted at the level of

parties’ representatives and senior executives. If direct discussions fail to resolve the issue, the dispute is referred to one of the methods described under the third module: mitigation or mediation. If disputes reach this stage without being resolved, the parties shall resort to binding dispute resolution means for a final and binding judgment.

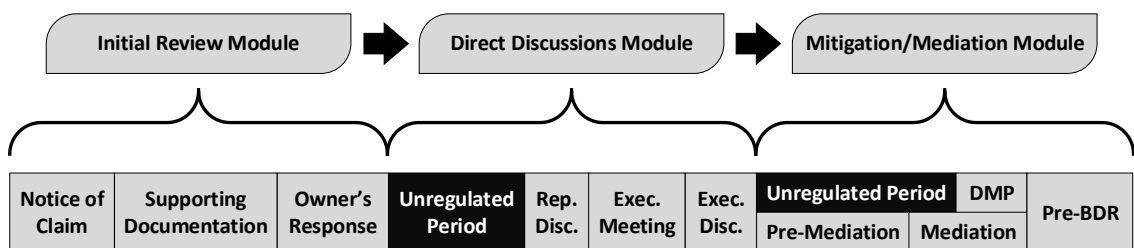


Figure 17. ConsensusDocs Schematic Claim/Dispute Resolution Timeline

a. Initial Review Module

Pursuant to “§ 8.4 Changes Notice”, a claim is initiated when a contractor submits to the owner a written notice of the claim within fourteen days after the occurrence of the event giving rise to the claim or within fourteen days upon recognizing the conditions giving rise to the claim, whichever is later. The notice of the claim shall be given prior to proceeding with the works, except in an emergency. Following the notice of claim, the contractor has a period of twenty-one days to submit all written documentation, including supporting data. However, this period can be extended upon the mutual agreement of the contracting parties. Upon the receipt of the contractor’s claim, the owner shall review it and respond accordingly within a maximum period of fourteen

days, as shown in scenario A.1 in Figure 18. The owner can either approve the claim or deny it. On the other hand, scenario A.2 illustrates the case where the owner fails to respond within the allocated period. As such, the claim is deemed denied.

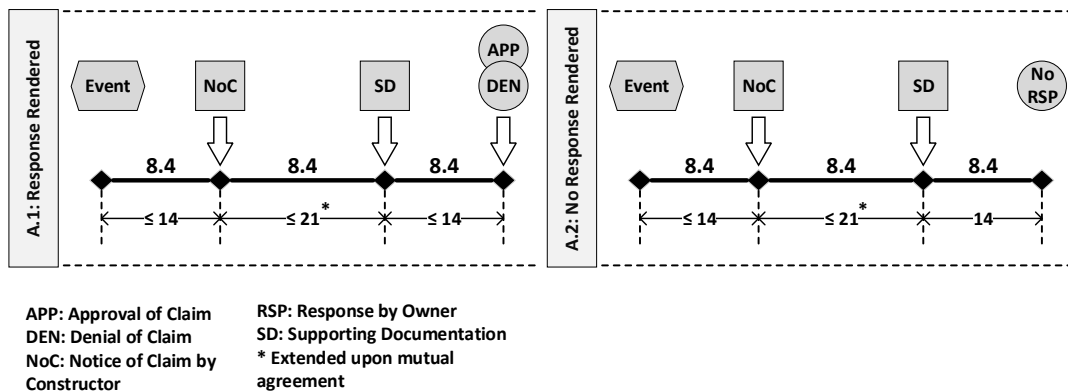


Figure 18. Initial Review Module

b. Direct Discussions Module

Any claim arising during the course of the construction project escalates into a dispute and moves to the direct discussions module, except for those approved by the owner. Under this module, one of the scenarios presented in Figure 19 occurs. Upon denial of the dispute by the owner through an official response or the lack thereof at the 14-day deadline, the dispute progression enters an unregulated period where it remains in an idle state unless and until the contracting parties mutually agree to initiate direct discussions. Once initiated, direct discussions shall start between the parties' representatives who shall (1) possess the necessary authority to resolve disputes and (2)

record the date of the first discussions. Parties' representatives shall reach an agreement within five days from the date of first discussions (scenario B.1). If the parties' representatives fail to do so within the allocated period, they have to notify their senior executives immediately in writing that a resolution could not be reached. As such, the senior executives of the parties shall meet within five days from the date of the receipt of such notice. Senior executives shall look into the matter to endeavor reaching a resolution within fifteen days from the date of the first discussions (scenario B.2). However, if such period expires with disputes not being resolved, the direct discussion period ends, where parties shall refer such matter to either mitigation or mediation (scenario B3).

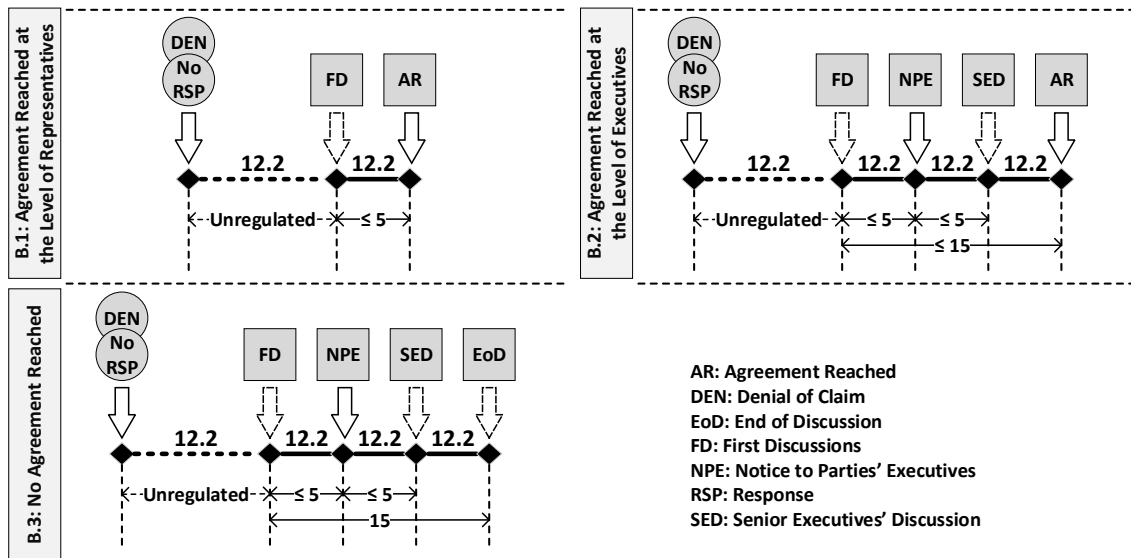


Figure 19. Direct Discussions Module

c. Mitigation/Mediation Module

Disputes that were not resolved through direct discussions shall escalate to mitigation (Figure 20), where one of the dispute mitigation procedures, project neutral (“neutral”) or dispute review board (“DRB”), under “§ 12.3 Mitigation” shall be selected. A Neutral or a DRB shall be mutually selected and appointed by the contracting parties as soon as practicable after the execution of the agreement. Contracting parties can refer disputes to mitigation at any time, introducing a second unregulated period within the claim/dispute resolution timeline.

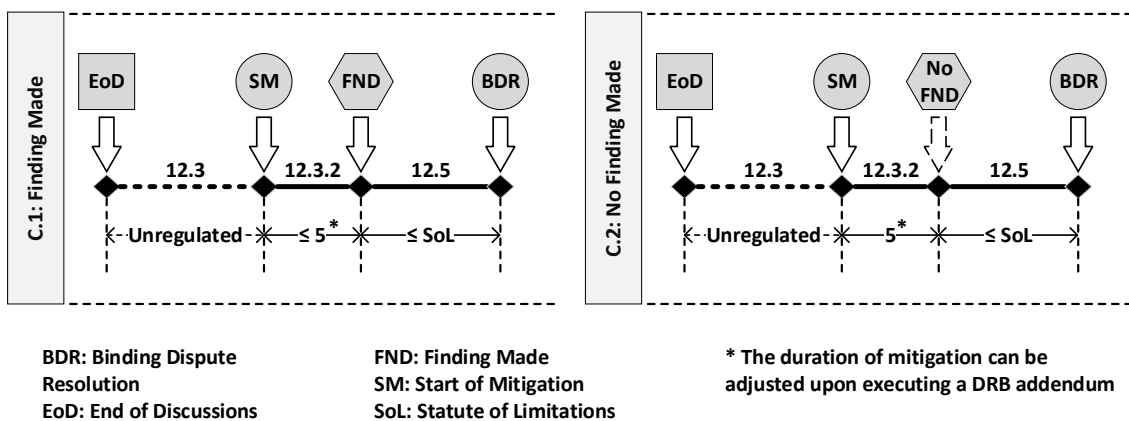


Figure 20. Dispute Mitigation Procedures

Once a dispute is escalated to mitigation, the mitigation procedure is triggered, and the Neutral or the DRB issues a nonbinding finding within a period of five days. However, § 12.3.3 stipulates that this time requirement can be adjusted upon introducing a DRB Addendum. If the contracting parties were not satisfied with the

rendered finding (scenario C.1) or the DRB or Neutral fails to render a finding within the stipulated period (scenario C.2), the dispute shall be submitted to binding dispute resolution procedure stipulated under § 12.5. On the other hand, if none of the dispute mitigation procedures is selected under § 12.3, disputes that remain unresolved after direct discussions are referred to mediation, as shown in Figure 21. “§ 12.4 Mediation” stipulates that the mediation process shall convene within thirty days from the date of the first discussions and conclude within forty-five days from the date of the first discussions.

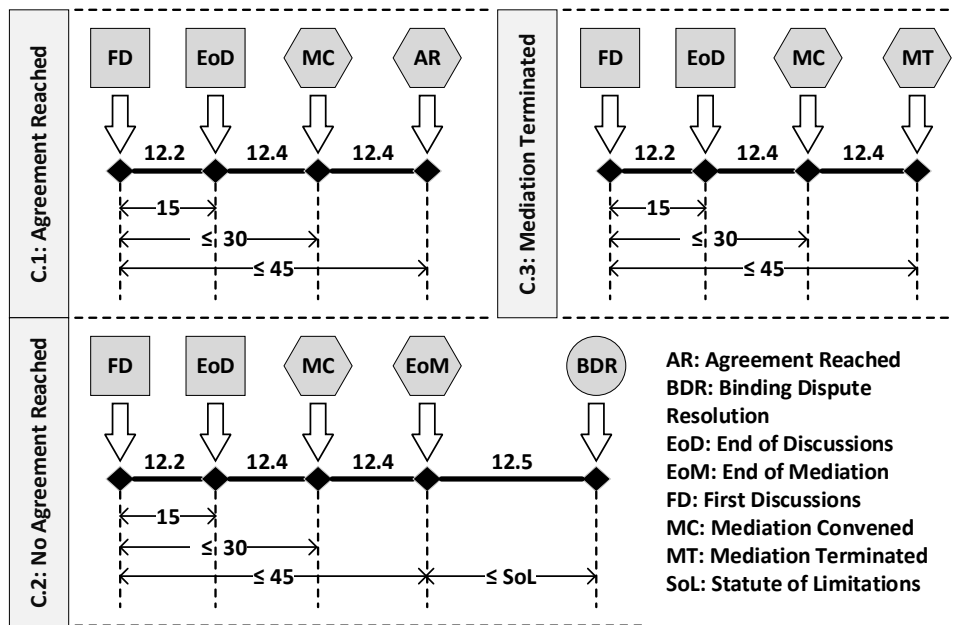


Figure 21. Mediation Procedure

As such, contracting parties shall endeavor reaching an agreement prior to the conclusion of the mediation process, as shown in scenario C.1. Otherwise, scenario C.2 shows that mediation ends, where unresolved disputes are then referred to binding dispute resolution. Although mediation is mandatory, § 12.4 stipulates that either party may terminate the mediation process at any time directly after the first session, as illustrated in scenario C.3.

2. Claim/Dispute Process Evolution Flowchart

A guide map that illustrates the overall claim/dispute process has been constructed to assist contract administrators and practitioners working on projects under the ConsensusDocs standard conditions. The presented flowchart in Figure 22 summarizes all the scenarios encountered under the three modules discussed above.

Starting with the initiation of a claim, a notice of the claim shall be issued within fourteen days and supporting documents furnished within twenty-one days to proceed to the next stage: owner's response. Under the latter stage, the claim enters into a loop with three different outcomes: (1) approval of the claim, (2) denial of the claim, or eventually (3) the expiry of the fourteen-day period. Outcomes 2 and 3 move the claim to the direct discussion stage, where it remains in an idle state until the contracting parties mutually agree to initiate discussions. To differentiate this duration, this stage was highlighted in black to indicate that it is an unregulated period where the process could drag on for a long period of time. Once direct discussion is initiated, the claim

moves to the parties' representatives' discussion stage and an opportunity to end the process if agreement is reached exists. Otherwise, it is referred to the parties' senior executives for a second chance of reaching agreement. Failing to do so shifts the claim to the following stage where dispute mitigation options through a Neutral or a DRB are evaluated. If a mitigation mechanism is selected, the claim moves to the mitigation stage where another unregulated period ensues. As such, things could drag on again at this point in time until mitigation is initiated.

Under mitigation, the claim/dispute process could end if the contracting parties were satisfied with the nonbinding finding, which shall be rendered within five days. Otherwise, the dispute moves to the binding dispute resolution if (1) the nonbinding finding was not made within five days, or (2) contracting parties were not satisfied with the issued finding.

Alternatively, a dispute is referred to mediation if no mitigation procedure was selected. Under this dispute resolution procedure, three outcomes are available: (1) reaching agreement prior to the expiry of the mediation's time-bar, (2) concluding mediation upon the expiry of its time-bar, or (3) terminating the mediation process at any time. The first outcome ends the process upon reaching an agreement. Outcomes 2 and 3, on the other hand, move the dispute to the final stage that is binding dispute resolution.

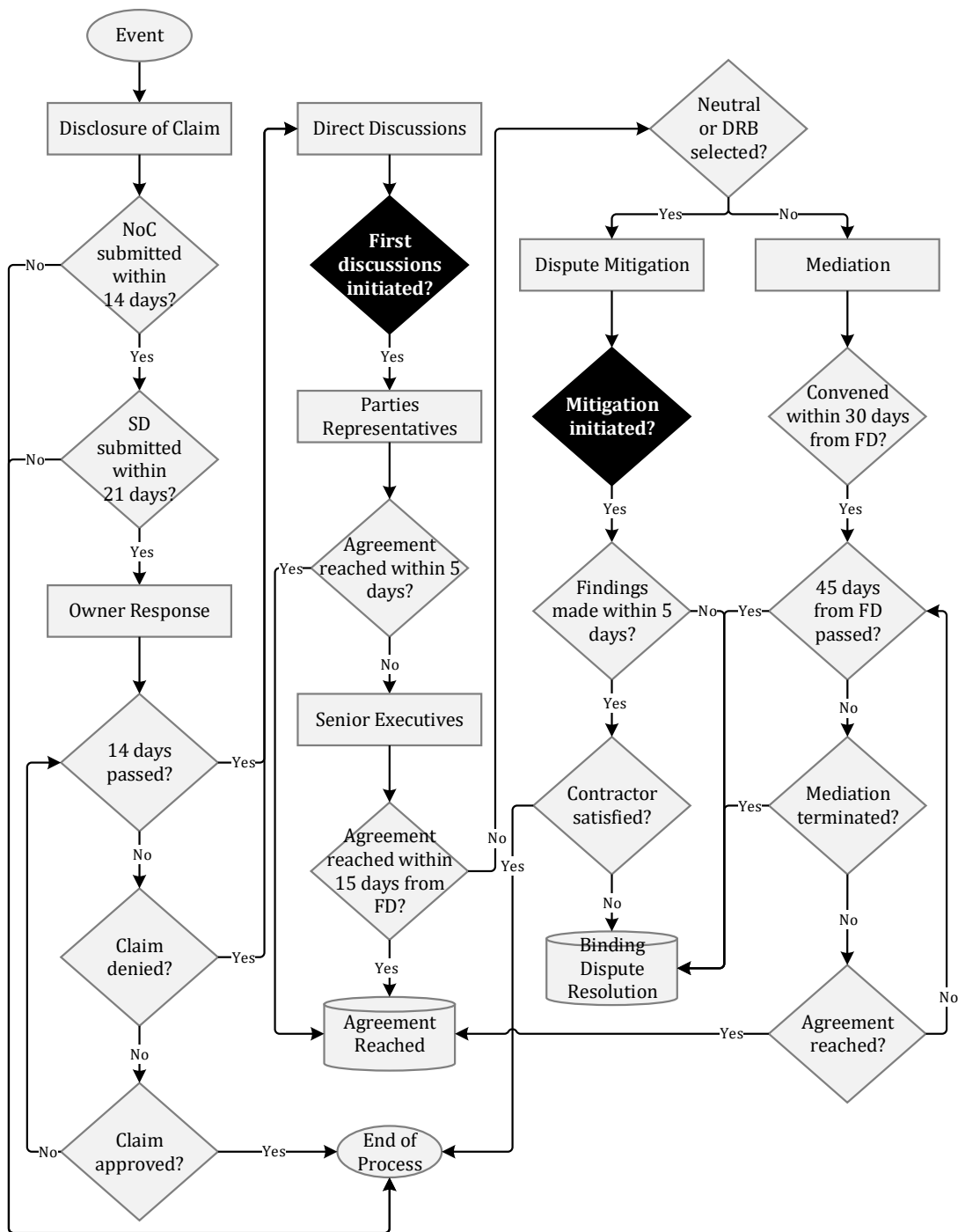


Figure 22. Claim/Dispute Resolution Process Flowchart

3. Discussions

Referring to the above analysis, it can be inferred that the progression of claims/disputes may take place along an array of possibilities. This section highlights a number of observations pertaining to the importance of the first discussions and the rooms of unregulated periods, to which it proves quite worthwhile to draw the attention of contract administration professionals and contracting parties.

a. First discussions

Throughout the claim/dispute resolution mechanisms several gates exist as a preceding condition to the succeeding stages. The failure of fulfilling a preceding condition gate prolongs the claim/dispute resolution process. However, in most of the cases, condition precedent gates have time-bars that deactivate the gate's property upon its expiry (AIA 2017, EJCDC 2013). Accordingly, a party would be able to proceed to the next stage even if the condition precedent gate was not fulfilled.

The underlying claim/dispute resolution mechanism imposes direct discussions as a conditional precedent to mitigation/mediation and binding dispute resolution. However, the relevant conditions do not stipulate a time-bar for the contracting parties to act upon. Consequently, if the contractor and owner fail to mutually agree to initiate direct discussions, the contractor will not be able to proceed and pursue other resolution procedures. As such, the dispute resolution process can only conclude pending expeditious, active, and positive actions from the both sides. Hence, the contract

conditions offer the owner, indirectly, the authority to control the evolution process of disputes.

b. Unregulated Periods

Non-time-barred periods are referred to as unregulated periods where a claim/dispute could remain for a long period of time. Unregulated periods are considered to be the core reason for prolongation of the claims/disputes resolution process, which is a feature of the mechanism that contracting parties could exploit to pile up claims/disputes. Initially, the underlying mechanism offers one unregulated period that is directly precedes the initiation of direct discussions. However, if mitigation was chosen as the dispute resolution procedure, then another unregulated period is introduced prior to the initiation of the corresponding procedure. As such, it is highly probable, given the typical real-world circumstances of construction projects, that resolving disputes would mostly takes place at a late stage into the construction period, or even beyond that.

D. EJCDC Claim/Dispute Resolution Mechanism

This section aims at diligently studying the underlying claim progression mechanism under the EJCDC standard conditions with the aim of formulating all possible scenarios that are likely to be encountered and ultimately developing a comprehensive guide map to aid owners and contractors in administering the claim process. Other contributions lie in: (1) offering a thorough analysis of the findings vis-à-vis several aspects that include,

but are not limited to, owner-contractor communication, mediation process characteristics, rooms for resolving claims, receiving party action, etc., and (2) devising recommendations to clarify ambiguities present within the language of the EJCDC claim-related article.

1. Research Methodology

In order to achieve the aforementioned objectives, the research addresses issues in three specific task areas: (1) examining “Article 12 – CLAIMS” under the EJCDC standard conditions, developing the underlying schematic claim/dispute timeline, and summarizing the different stipulated properties of its stages, (2) conducting a detailed analysis of the claim timeline and identifying a gamut of scenarios depicting different possibilities of claim progression along the corresponding timeline, and (3) designing a comprehensive and cohesive framework to illustrate the overall claim process evolution.

2. Underlying Claim Progression Mechanism

Several types of conflicts can possibly arise between the owner and contractor during the course of a construction project. For instance, under “Article 12 Claims”, Clause 12.01.A, EJCDC specifies that the following conflict types are typically submitted to the claim process: (1) “appeals by Owner or Contractor of Engineer’s decisions regarding Change Proposals, (2) Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents, and (3) disputes that

Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters”. This article was further examined and an overall claim timeline together with its corresponding stages were extracted as depicted in Figure 23 and Table 13, respectively.



Figure 23. Schematic Claim/Dispute Timeline

When facing one of the aforementioned conflicts, the claimant, either the owner or contractor, shall trigger the claim mechanism by submitting a claim, including supporting data, to the other party. Additionally, the claimant shall furnish a copy of the claim to the engineer for its information only. As mentioned in Clause 12.01.B and illustrated in Figure 23 and Table 13, the claim shall be submitted within 30 days from the start of the event, or from the day the decision was rendered, if the claim deals with change proposal appeals. In the case of a contractor claiming for additional time or money, the contractor shall state that “(1) the claim is made in good faith, (2) the supporting data are accurate and complete, and (3) to the best of Contractor’s knowledge and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled”.

Once the claim is submitted, the review and resolution stage is triggered. According to Clause 12.01.C, the parties shall exchange information and negotiate directly as an attempt to resolve the claim. As inferred from Clause 12.01.F, the review and resolution stage can span up to 90 days. However, parties may mutually agree on extending the duration of this stage to increase the chances of resolving a claim on hand. In this case, at any time within the review and resolution stage (i.e. after x days), both parties may mutually agree to mediate. According to Clause 12.01.D.2, mediation can last up to 60 days (i.e. $y \leq 60$), beyond which either party can terminate it. Moreover, the mediator can conclude mediation at any time if it is deemed unsuccessful. Once mediation ends, $90-x-y$ days remain from the review and resolution stage (Table 13). Within the second part of the review and resolution stage, the receiving party is to render an action (i.e. RPA), which is born as final and binding, as long as this stage is ongoing (12.01.E). As such, the receiving party can approve the claim in whole, approve it in part and deny it in part, or deny it in whole. Once an action is rendered, the claimant can invoke the final resolution of dispute procedure set forth in “Article 17 – FINAL RESOLUTIONS OF DISPUTES” to revoke the property of this action.

If the receiving party does not issue an action within 90 days, the claim falls into an unregulated period that can be ended by either of the parties submitting a denial-of-claim letter (i.e. DoC), or the receiving party rendering an action (i.e. RPA). Given any of the two actions, the claimant has 30 days to invoke final resolution of dispute in order

to revoke the action’s final and binding property. Failure to trigger the final resolution of dispute stage confirms the finality of action taken by the receiving party, whereby neither party has the option to open again the dossier of the claim.

Table 13. Claim Process Stages

Stage	Time Bar (Days)	Triggered By	Parties Involved	Actions	Corresponding Clause
Submittal of Claim	30	Event	Claimant: Contractor or Owner Receiving Party: Owner or Contractor	Submit the claim and the supporting data to Receiving Party directly	12.01.B
Review & Resolution	x	Receiving claim and supporting data from the claimant	Owner and Contractor directly	Exchange of information and direct negotiation Issue an action (by receiving party)	12.01.C 12.01.E
Mediation	y ≤ 60	Mutual agreement of both parties to mediate	Owner, Contractor, and Mediator	Mediate to reach an agreement	12.01.D
Review & Resolution	90-y-x	End of Mediation	Owner and Contractor directly	Exchange of information and direct negotiation Issue an action (by receiving party)	12.01.C 12.01.E
Unregulated Period	Unregulated	End of review and resolution stage with no action being issued	Party Triggering: Receiving Party Party Ending this Period: Contractor or Owner	Issue a denial-of-claim letter to the other party Issue an action (by receiving party)	12.01.F 12.01.E
Pre-Final Resolution of Dispute	30	Action Taken	Claimant	Invoke final resolution of dispute under Article 17	17

3. Detailed Analysis of the Claim Timeline

In this section, the overall claim timeline presented above is further dissected to elaborate on the possibilities prevailing at each of the timeline stages and their corresponding gates. To this end, four different scenarios transpired and are discussed in the following subsections.

a. Scenario A

This scenario assumes that parties do not resort to mediation and instead communicate directly to resolve the claim (Figure 24). This is actually valid because the EJCDC conditions offer both the owner and contractor the option to mutually agree to mediation and does not impose it. Consequently, once the claim dossier is submitted within 30 days, the review and resolution stage is triggered and the claim remains at this stage for a span of 90 days that is extendable upon the parties' mutual agreement. More specifically, scenario A.1 illustrates that at any time within the review and resolution stage, the receiving party is eligible to issue an action stating whether the claim is approved, partially approved, or denied. With reference to Clause 12.01.E, the rendered action triggers the 30-day pre-final resolution of dispute stage during which the claimant can express his dissatisfaction vis-à-vis the issued action. If dissatisfied, the claimant has to invoke the final resolution of dispute within that period in order to revoke the final and binding property of the rendered action.

On the other hand, scenarios A.2 and A.3 depict the case of inaction on the claim by the receiving party within the 90-day review and resolution period and hence the initiation of the unregulated period (Figure 24). Under scenario A.2, the claimant uses the unregulated period can be viewed as a window during which the claimant may exercise further patience, thereby allowing the receiving party more time to render an action (i.e. RPA). Similar to the other cases, the receiving party action can be either approval, partial approval, or denial after which the contractor has 30 days to act upon

the rendered action. Under scenario A.3, and with reference to Clause 12.01.F, either the owner or contractor can at any time within the unregulated period submit a denial-of-claim (DoC) letter to the other party, thereby commencing the time for appeal of the denial. This gated mechanism is crucial for both the owner and contractor. On one side, the owner benefits from not allowing claims to stall and from driving the contractor to act within 30 days in regard to the claim's denial. On the other side, it might be in the interest of the contractor to have the claim proceed until final resolution of dispute.

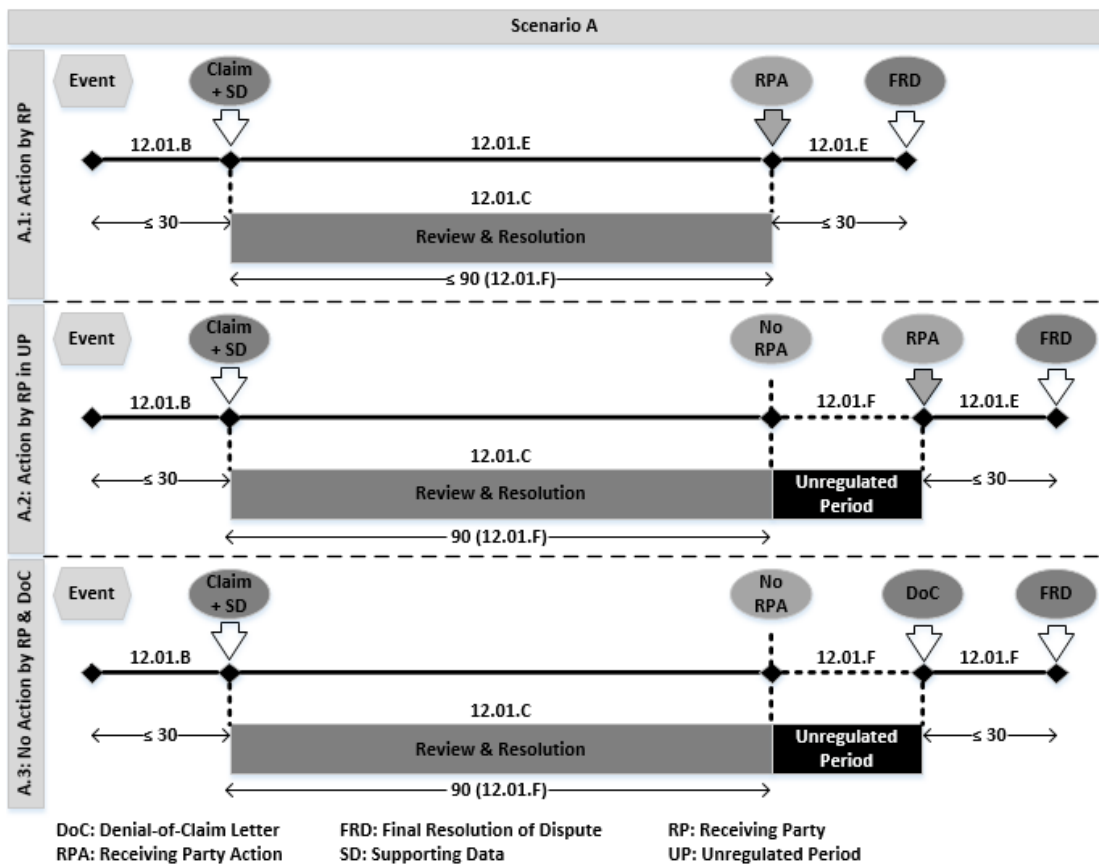


Figure 24. No Mediation Conducted

b. Scenario B

This scenario, as opposed to scenario A, illustrates the case of resolving the claim through mediation (Figure 25). With reference to the Clause 12.01.D.1, the owner and contractor may mutually agree to mediation during the review and resolution stage. Upon referring the matter in dispute to mediation, a third party is appointed as a mediator who shall act impartially in attempting to have the parties reach agreement.

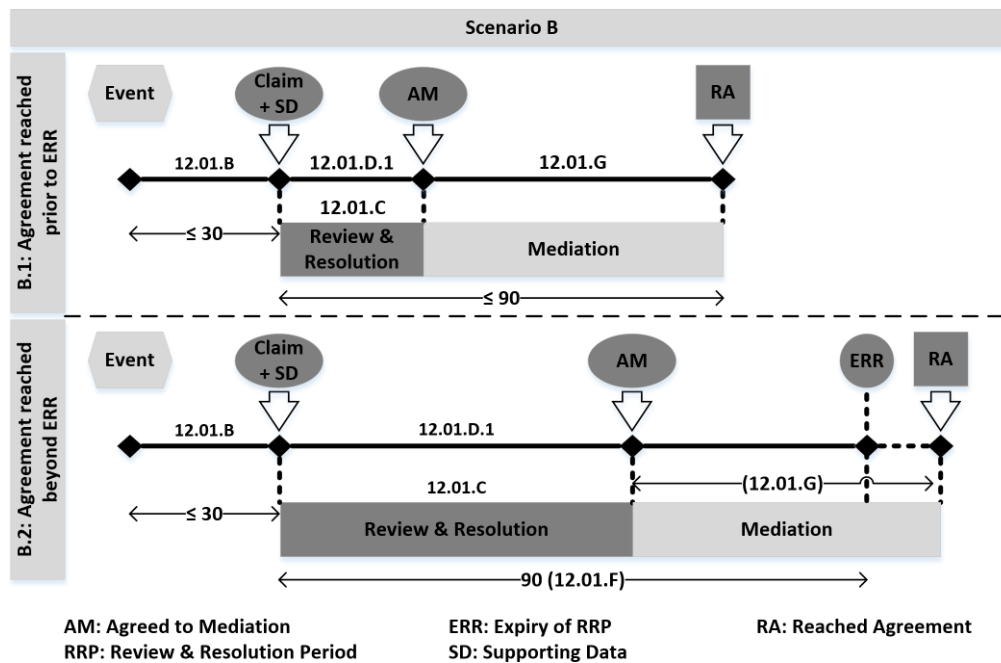


Figure 25. Mediation Conducted and Agreement Reached

In this case, agreement can be either reached: 1) prior to the expiry of review and resolution period (i.e. ERR) as shown in scenario B.1, or (2) beyond the expiry of the review and resolution stage as illustrated in scenario B.2. This scenario shows that

both parties are being cooperative and, as such, the mediator does not conclude mediation until agreement is reached. At this juncture, and with reference to the Clause 12.01.G, the agreement shall be incorporated in a change order indicating its effect on contract's time, contract's price, and/or the works.

c. Scenario C

This scenario depicts the case of mediation that ends prior to the expiry of the review and resolution period with no agreement reached (Figure 26). In this case, according to the Clause 12.01.D.2, the mediator can conclude mediation at any time if the parties were not being cooperative and hindering the mediation process. On the other hand, the same clause stipulates that either of the parties can terminate the mediation process after 60 days from agreement to mediation. Once mediation ends, the review and resolution stage shall resume. Beyond this stage, the claim mechanism proceeds in a manner similar to that under scenario A, whereby either: (1) the receiving party issues an action prior to the expiry of review and resolution stage (Scenario C.1), (2) the receiving party renders an action during the unregulated period (Scenario C.2), or (3) the owner or contractor issues a denial-of-claim letter due to the inaction of the receiving party (Scenario C.3). Once any of the aforementioned options is exercised, the claimant has 30 days to invoke the final resolution of dispute or else, the action is incorporated in a change order.

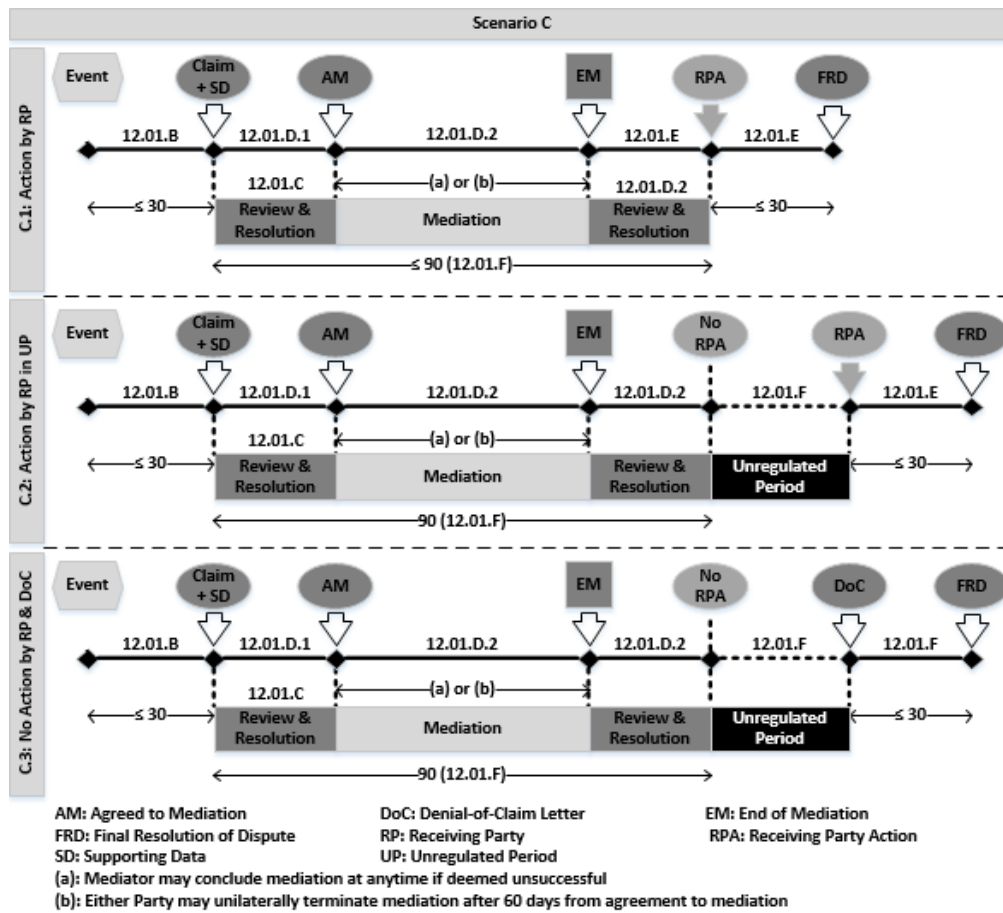


Figure 26. Mediation Ended Prior to the Expiry Of “Review and Resolution” Stage – No Agreement Reached

d. Scenario D

This scenario depicts the case of mediation that ends after the expiry of the review and resolution period with no agreement reached (Figure 27). This can happen under two instances: (1) the parties mutually agree to mediate towards the end of the review and resolution stage, and as such, the 60-day period of mediation, if not concluded by the mediator, can go beyond the 90-day period of review and resolution; and (2) the

ongoing mediation process that was neither concluded by the mediator nor terminated by either party within the 60-day period can stretch beyond the 90-day review and resolution stage.

As mediation is concluded by the mediator or terminated by either party after the expiry of the review and resolution stage with no agreement reached, the claim thereby falls directly in the unregulated period. Consequently, the receiving party can issue an action at any time thereafter (Scenario D.1) unless and until either the owner or contractor issues a denial-of-claim letter (Scenario D.2). In this case and similar to all other scenarios, the claimant has 30 days to invoke the final resolution of dispute.

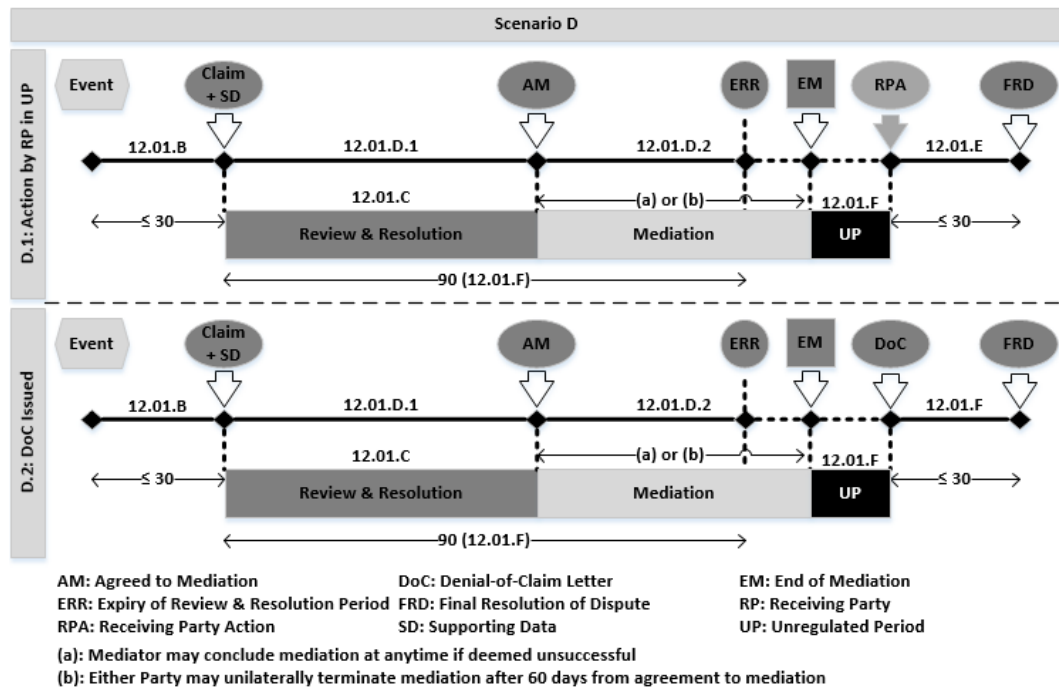


Figure 27. Mediation Ended After the Expiry Of “Review and Resolution” Stage – No Agreement Reached

It is worth mentioning that the scenario of ongoing mediation happening after the expiry of the 90-day review and resolution stage can be misinterpreted by triggering the unregulated period as shown in Figure 28. In this latter case, it is assumed that the parties can directly interrupt mediation by issuing a denial-of-claim letter. However, this is not valid as Clause 12.01.D.2 explicitly states that upon ending mediation “the Claim submittal and decision process shall resume”. Therefore, the claim and review process cannot overlap with that of mediation, and the former gets suspended until the latter ends.

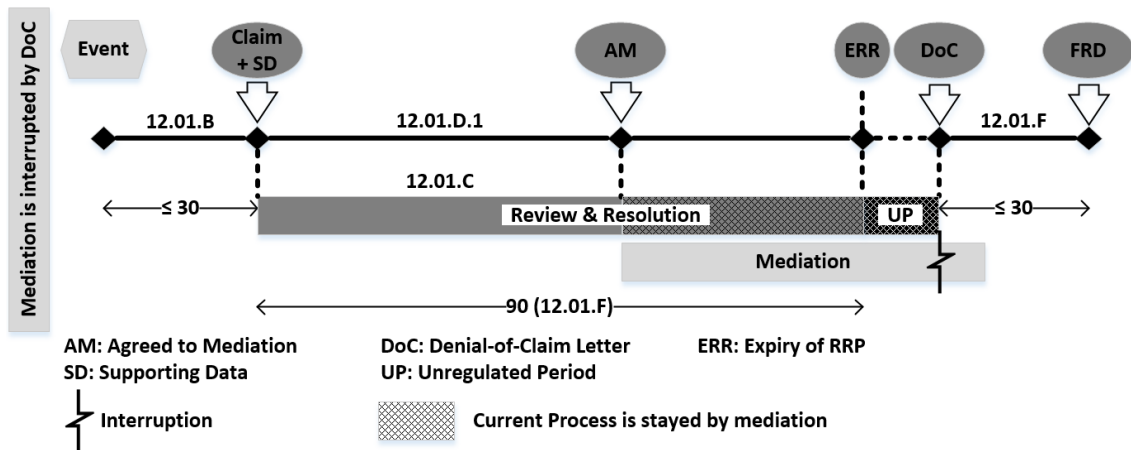


Figure 28. Misinterpretation of Interaction Between Mediation and Decision Process

4. Flowchart of Claim Process Evolution

In order to further help practitioners and contract administrators working on projects under the EJCDC standard conditions, this section summarizes all four

scenarios through a flowchart depicting the full claim process evolution (Figure 29). Under the claim and supporting data submittal stage, a gate of submitting the claim dossier within 30 days exists. Satisfying this requirement moves the claim to the review and resolution stage within the claim process and decision's loop. The first gate under the review and resolution stage checks for the expiry of the stage's time-bar, be it the 90-day period or the extended duration mutually agreed upon. As long as the duration of the review and resolution stage does not expire, the claim can proceed to the second action gate, which is "agreement to mediate". In this case, if the parties do not agree to mediate, the claim moves to the receiving party action gate, where such party, in turn, can opt to render a decision directly without referring the matter to mediation. However, if the 90-day or extended duration gate expires with no action rendered, then the claim falls in the unregulated period and cannot exit it unless a denial-of-claim letter is issued by either party or an action is rendered by the receiving party. In both cases, scenario A occurs and the claim then moves to the pre-final resolution of dispute stage whereby a gate of invoking the final dispute resolution procedure within 30 days from issuing the action exists. Once this requirement is satisfied, the procedure of final resolution of dispute as set forth in "Article 17" gets triggered. However, failure to invoke "Article 17" within 30 days leads to incorporating the final and binding action in a change order.

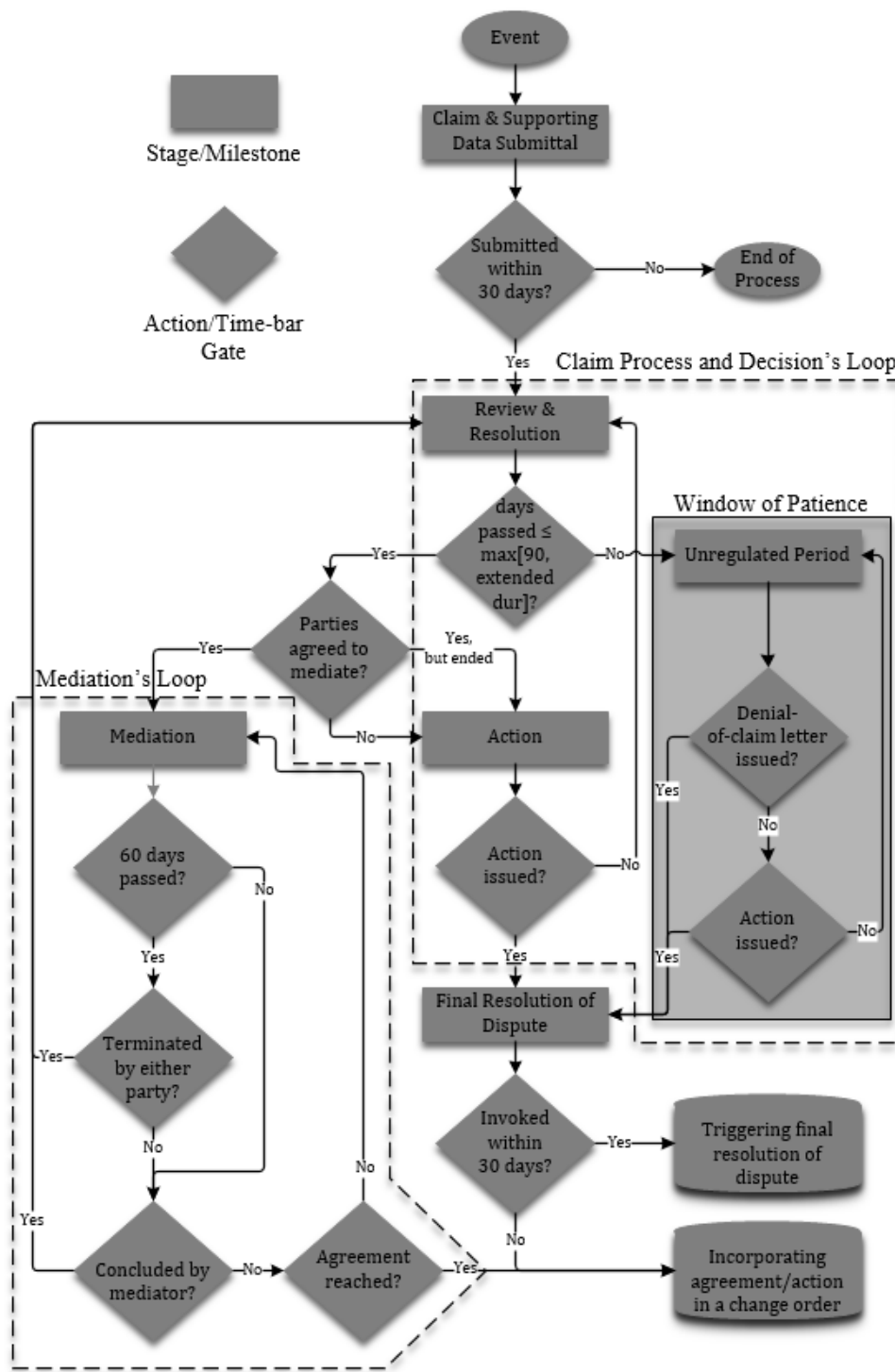


Figure 29. Flowchart of Claim Process Evolution

On the other hand, the “agreement to mediate” gate was placed before the receiving party action gate because as stated in the Clause 12.01.D.1, “mediation shall stay the claim submittal and response process”. In other words, the claim process gets suspended, and the receiving party is not allowed to respond while mediation is ongoing. Thus, the parties’ agreement to mediate shifts the claim from the claim process and decision’s loop to the mediation’s loop. Once in the mediation’s loop, the claim stays there until: 1) agreement is reached, 2) mediator concludes mediation, or 3) either party terminates mediation upon the expiry of 60 days. These three exits of the mediation’s loop are presented as action gates under the mediation stage. Furthermore, since parties can only terminate mediation after 60 days from agreeing to mediate, a 60-day time-bar gate was added to satisfy the time-constraint termination gate. Exiting the mediation’s loop through the first gate represents scenario B, under which agreement reached is incorporated in a change order. On the other hand, exiting the mediation’s loop through the second or third gate (that is, mediator concluding mediation or either party terminating mediation) moves the claim back to the review and resolution stage within the claim process and decision’s loop. In this latter case, if the 90-day or the extended period is not expired, then the claim ends up in scenario C. As mentioned above, a receiving party action rendered prior to the expiry of review and resolution stage, a denial-of-claim letter issued within the unregulated period, or a receiving party action rendered within the unregulated period moves the claim to the pre-final

resolution of dispute stage that triggers the procedure set forth in Article 17, if invoked within 30 days. However, exiting the mediation's loop after the expiry of review and resolution stage duration, with no agreement reached, triggers scenario D. Consequently, the claim moves directly to the unregulated period where either one of the parties issues a denial-of-claim letter, or the receiving party renders an action. The claim then moves to the pre-final resolution of dispute stage where the process proceeds in a manner similar to that mentioned in scenarios A and C.

It is worth noting that the mediation's loop and the claim process and decision's loop, shown in the process flowchart (Figure 7), are mutually exclusive whereby a claim can only be in one of the loops at a time. This is due to the fact that mediation stays the claim submittal and response process, which in turn resumes only after mediation ends. In other words, once the claim proceeds to the mediation's loop, it cannot exit it until mediation is over. This further clarifies the misinterpretation that was presented in Figure 6 and justifies how a claim only moves to the unregulated period when: (1) the review and resolution stage expires and (2) the mediation process ends.

5. Discussion

After analyzing, in detail, the underlying claim progression mechanism under the EJCDC standard contract conditions and presenting all possible scenarios, this section discusses the various findings and interprets them with regard to different aspects, namely: (1) owner-contractor communication, (2) rooms for resolving claims, (3)

review and resolution stage's underlying properties, (4) mediation process characteristics, (5) receiving party action, and (6) dispute closure/final resolution.

a. Owner-Contractor Communication

The claim progression analysis showed, under all scenarios, that the project owner communicates directly with the contractor throughout the claim process. This starts by the contractor addressing the owner directly upon submitting claims and then both negotiate within the review and resolution period to reach agreement. The project owner is then placed at the forefront of the process by having to decide on actions pertaining to the contractor's submitted claims. To this end, the owner is in charge of communicating with the contractor at almost all stages of the claim process.

It is worth noting that this direct communication between the owner and contractor under EJCDC standard conditions is witnessed as well under other standard conditions in different forms. For instance, the contractor, under ConsensusDocs standard conditions, communicates upfront with the project owner when filing the claim who, in turn, has to issue a response. The contractor communicates as well with the project owner within the direct discussion phase, which is similar to the review and resolution stage under EJCDC (Consensus Docs 2017). On the other hand, the direct communication between the contractor and owner under the AIA standard conditions happens only following the receipt of the initial decision from the initial decision maker (AIA 2017). This happens even later in the claim process under FIDIC standard

conditions (FIDIC 1999). In this case, the contractor addresses the engineer first to get a determination pertaining to the submitted claim. Next, a dissatisfied contractor refers the dispute to the dispute adjudication board for decision rendering. If dissatisfied, the contractor then communicates directly with the owner by sending a notice of dissatisfaction in regard to the rendered decision. As such, the fact that the project owner has to ultimately deal with any unresolved dispute, this upfront direct communication, and negotiation for up to 90 days, with the contractor, as prescribed under the EJCDC standard conditions, can rather be regarded as conducive to giving any such claims a higher likelihood of being resolved early on along the resolution mechanism timeline.

b. Rooms for Resolving Claims

It was noted that the EJCDC standard conditions urge the parties to reach mutual agreement regarding matters in dispute and facilitate that by opening three rooms to resolve claims, namely: (1) direct negotiation, (2) mediation, and (3) other alternative resolution methods (Article 12.01.G). The parties shall first endeavor to reach agreement within the review and resolution stage through direct negotiation and exchange of information. The period of the review and resolution stage can be extended upon mutual agreement to give more room for negotiations. Furthermore, the EJCDC conditions allow the parties to opt for mediation while negotiating in an attempt to reach agreement. Besides mediation, the parties can adopt any other alternative dispute

resolution technique to reach agreement, which can be used within the review and resolution period or at any other point within the claim process in order to facilitate the resolution of claims.

c. Review and Resolution Stage's Underlying Properties

The 90-day period of the review and resolution stage can be interpreted from different angles. On one hand, it can be viewed as a long time-barred stage when compared to periods given for rendering the first judgment under other standard conditions. For example, in comparison to this EJCDC 90-day review and resolution period, the owner has up to 14 days to render a response pertaining to the submitted claim under the ConsensusDocs standard conditions (ConsensusDocs 2017), the initial decision maker has up to 30 days to issue an initial decision under the AIA standard conditions (AIA 2017), and the engineer has up to 42 days to render a determination under the FIDIC standard conditions (FIDIC 1999).

On the other hand, this 90-day period allows the parties to negotiate directly and exchange information and even opt for mediation, as mentioned above, in an attempt to reach agreement. These multi-resolution attempts, under the EJCDC standard conditions, increase the chances of resolving claims and reaching a settlement early on.

d. Mediation Process Characteristics

It was observed that mediation, under EJCDC standard conditions, can be implemented before the receiving party issues an action, which is not the case under other standard conditions, under which the alternative dispute resolution techniques are adopted later in the claim process after rendering the first judgment/opinion in respect to the claim on hand (AIA 2017, ConsensusDocs 2017, FIDIC 1999). This early attempt of conflict resolution is believed to have the effect of increasing the chances of reaching agreement, thereby resolving claims amicably, and consequently helping maintain a less-strained relationship between the contracting parties.

Another point worth noting is that the initiation of mediation stays the claim and response process, while the ending of mediation resumes the claim and decision process. More specifically, once the parties mutually agree to mediation within the review and resolution stage, the claim process gets suspended and the owner/receiving party is denied the right to respond to the submitted claim (Clause 12.01.D.1). Once mediation ends with no agreement reached, the claim and decision process resume and, in this case, not only the receiving party is now able to render an action, but either party also has the option of issuing a denial-of-claim letter if the claim falls into the unregulated period (Clause 12.01.D.2). Furthermore, it is worth mentioning that although mediation stays the claim process; either party can: (1) still indirectly incite the mediator to conclude mediation by not cooperating within 60 days or (2) unilaterally terminate mediation after 60 days from agreement to mediation.

Furthermore, the mediation process can be at times tricky as the parties might agree to mediate at the end of the review and resolution period, hence dragging the 90-day period up to 150 days (i.e. possibly adding 60 days towards the end of the 90-day period). In this case, as aforementioned, it is until mediation is concluded by the mediator or terminated by either party due to an unreach agreement that an action can be rendered by the receiving party or a denial-of-claim letter can be issued by either party, thereby unreasonably elongating the overall claim process duration.

e. Receiving Party Action

Another point worth also discussing is the action that may be taken by the receiving party. This action has the property of being final and binding immediately upon its issuance by the receiving party, and such a property can be revoked by the claimant through invoking the final resolution of dispute stage. The unfavorable situation emanates from the scenario where the action taken by the receiving party is to effect of rejecting the claim on hand or where no action at all is taken. Under such a condition, the claimant (e.g. contractor) is deprived the opportunity to receive any reimbursement or extension, not even a partial one, in connection with the claimed additional money or time, respectively. Accordingly, the contractor shall wait for the award of final resolution of dispute (i.e. approval or partial approval) to receive any additional monetary and/or a time extension award(s). Such a late effectuation of binding and final awards, if any, are likely to take place after the contractor has been exhausted

financially, inclusive of having possibly endured the levying of liquidated damages by the owner.

f. Dispute closure/final resolution

One of the ultimate problems that owners typically face throughout the claim process is a delayed closure, whereby contractors do not often refer matters in dispute to arbitration expeditiously. However, inherent to the EJCDC standard conditions is the ability to control this potential dragging effect by giving either party the right of to trigger an expeditious closure/final resolution of dispute in many ways. On the one hand, the receiving party can render an action, which is viewed as condition precedent for the pre-final resolution of dispute phase. On the other hand, the receiving party inaction shifts disputes into the unregulated period. Nevertheless, the EJCDC standard conditions allow the receiving party to still render an action (i.e. approval, partial approval, or denial in whole) at any time within the unregulated period until and unless a denial-of-claim letter has been issued, thereby denying the claim or considering the claim to have been denied. In this case, whether it is a denial-of-claim letter or an action that is issued, the 30-day time-bar of the pre-final dispute resolution stage gets triggered. In other words, the claimant has only 30 days to invoke the final resolution of dispute in order to revoke the rendered action or the denial-of-claim letter.

This is actually not the case for other standard conditions, where it is likely that the referral to arbitration can be as late as it may be allowed by the statute of limitations

of the laws governing the contract. For example, under the AIA standard conditions, when mediation ends with no agreement reached in respect to a submitted claim, the owner has 30 days to demand the contractor to file for arbitration (AIA 2017). If this demand is filed within the stated period, the contractor has then 60 days to file for arbitration. However, if the owner fails to file for the said demand, the lengthy effect of the statute of limitations gets triggered. On the other hand, under the FIDIC standard conditions, once the contractor issues, within 28 days, a notice of dissatisfaction vis-à-vis the rendered dispute adjudication board's decision, the pre-arbitration phase gets triggered during which the referral of a dispute on hand to arbitration can take place on or after the fifty sixth day from the date of issuance of the board's decision, but within the constraint imposed by the governing statute of limitations (FIDIC 1999). Similarly, under the ConsensusDocs standard conditions, the dispute can be referred for arbitration within the relevant statute-of-limitations period upon the completion of either the mitigation or mediation stage (ConsensusDocs 2017).

6. Recommendations

Based on the above detailed analysis and discussion, and to the best knowledge of the authors, this section recommends clarifications to the current language of some of the claim article's clauses under the EJCDC standard conditions. For instance, it is not clear whether mediation only stays the claim submittal and response process, or it suspends the review and resolution stage clock as well. As such, it seems worthy of advising that

Clause 12.01.D be clarified such that it clearly states whether, upon the parties agreeing to mediation during the review and resolution stage, the 60-day mediation period has the effect of depleting the 90-day review and resolution stage or not.

Moreover, Clause 12.01.F mentions that “If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial”. In this case, it is recommended to clarify that either party cannot issue a denial-of-claim letter when mediation is still ongoing, albeit outside the review and resolution period.

Furthermore, it is believed that the language of Clause 12.01.E is not lucid and does not clearly state all the courses of action a receiving party can take, in particular when the 90-day review and resolution stage elapses. In fact, in the same way a denial-of-claim letter can possibly be issued by the receiving party as a result of inaction within 90 days, an action (i.e. approval or partial approval) can alternatively be rendered by this same party. Hence, it is suggested to clarify, under article 12.01.E, that the receiving party, upon receiving the claim, can render an action at any time unless mediation is still ongoing or either party has submitted a denial-of-claim letter.

7. Conclusion

This paper examined in detail Article 12 of the EJCDC standard conditions (i.e. Claims) and delineated the underlying claim/dispute progression mechanism, together with

various deduced scenarios depicting all possible encountered situations. Furthermore, a comprehensive flowchart, mapping all scenarios developed, was devised to help guide contract administrators and other practitioners throughout the claim process. The findings transpired from the various scenarios revealed that: (1) the owner communicates right up front with the contractor and continuously throughout the claim process, (2) different windows for resolving claims are made available to facilitate attempting the achievement of mutual agreement between the parties, (3) multiple attempts are offered within the 90-day review and resolution period to increase the chances of resolving claims early on, (4) the mediation, as an alternative dispute resolution method, is adopted as a possible part of the first stage in the claim resolution process, before the receiving party renders an action, (5) the receiving party's rendered action is final and binding unless the claimant invokes final resolution of dispute, and (6) the dispute closure or final resolution can be invoked expeditiously to revoke the rendered action or to appeal the claim denial. Finally, some recommendations were suggested to clarify the ambiguities in the language used in some of the clauses within Article 12. These include clarifying the staying property of the mediation process, the ability of either party to issue a denial-of-claim letter after the mediation ends and the review and resolution period expires, and the capability of the receiving party to render an action beyond the 90-day period of the review and resolution stage in case a denial-of-claim letter was not placed.

E. FIDIC Claim/Dispute Resolution Mechanism

In this section, the underlying claim/dispute resolution mechanism under the FIDIC standard contract conditions is meticulously studied with the aim of exploring all possibilities within the claims' evolution process that are likely to be encountered. Another objective of this section is to develop a comprehensive guide map to help contracting parties and practitioners administer the underlying process. Other contributions lie in offering a thorough analysis of the finding to include: (1) the role of the engineer, (2) the full-term dispute avoidance/adjudication board, and (3) the piling of claims. Finally, a comparison between the second-latest conditions, released in 1999, and the new conditions, released in 2017, is presented to highlight the modifications introduced to the underlying claims/disputes resolution mechanism.

1. Research Methodology

The methodology below was followed to achieve the aforementioned objectives: (1) examining "Clause 20: Employer's and Contractor's Claims" and "Clause 21: Disputes and Arbitration", (2) extracting the underlying schematic claim/dispute timeline, (3) developing the spectrum of scenarios that may be encountered, and (4) designing a comprehensive framework to illustrate the overall claim process evolution.

2. The Underlying Claim/Dispute Resolution Mechanism

During the course of a construction project that adopts the FIDIC standard conditions, the contracting parties shall refer to the underlying mechanism set forth in “Clause 20 Employer’s and Contractor’s Claims” and “Clause 21 Disputes and Arbitration” to resolve arising conflicts. A meticulous examination of such relevant clauses resulted in extracting a schematic claim/dispute timeline as shown in Figure 30.



Figure 30. Schematic Claims/Disputes Timeline

A claim shall be initiated pursuant to sub-clause 20.2 “Claims for Payment and/or EOT”: (1) if the contractor considers himself entitled for an additional payment by the employer and/or an extension of time, or (2) if the employer considers himself entitled for a reduction in the contract price and/or an extension in the defects notification period. In either case, the claiming party shall issue a notice of claim to the engineer, describing the event or circumstance giving rise to the claim. The engineer is a third-party individual (or legal entity), appointed by the employer and named in the contract. Among the array of duties stipulated under sub-clause 3.2 “Engineer’s Duties and Authority”, those related to the underlying claim/dispute resolution mechanism are (1) conducting consultations with contracting parties in an endeavor to reach resolution and (2) making determinations of claims. When carrying out these duties in particular,

sub-clause 3.7 “Agreement or Determination” states explicitly that “the Engineer shall act neutrally between the Parties and shall not be deemed to act for the Employer”. Following the notice of claim, the claimant shall furnish a fully detailed claim that includes all supporting data. As such, the agreement phase is triggered, and the engineer consults with the parties involved to attempt reaching an agreement. If reaching an agreement fails, the engineer shall proceed to make a fair determination. If either party is dissatisfied with the outcome determination, that party shall issue a notice of dissatisfaction and refer the dispute to the dispute avoidance/adjudication board (DAAB). The DAAB, a third-party constituting of a sole suitably qualified member or three suitably qualified members, shall render a decision pertaining to the referred dispute. A dissatisfied party shall issue a notice of dissatisfaction to trigger the amicable settlement phase, where parties could use any alternative dispute resolution technique to resolve disputes amicably. Eventually, unresolved disputes beyond this stage escalate to arbitration.

3. Detailed Analysis

The claim/dispute schematic timeline illustrated in Figure 30 is composed of several phases, where progression possibilities are likely to prevail in each phase. For this reason, particularized scenarios applicable to each phase were constructed and presented in the following sections.

a. Disclosure of Claim

Disclosure of claim is the first phase of the claim/dispute resolution mechanism and is composed of three stages: (1) the notice of claim, (2) the engineer's initial response, and (3) the fully detailed claim. Within this phase, four scenarios were generated and presented in Figure 31.

Sub-clause 20.2.1 "Notice of Claim" stipulates that the notice of claim shall be issued within 28 days from the claimant's knowledge and awareness of the corresponding event or circumstance giving rise to the claim. Scenario A.1 presents the case where the claiming party fails to issue a notice of claim within the specified period. In such a scenario, the claiming party, like the contractor for example, will not be entitled for an addition payment by the employer and/or an extension of time. Similarly, if the claiming party was the employer, then he/she will not be entitled for a reduction in the contract price and/or an extension in the defects notification period. In either case, the other party shall be discharged of any liability regarding the event or circumstance giving rise to the corresponding claim.

On the other hand, the other three scenarios describe the scenarios where a notice of claim has been submitted within 28 days. Subsequently, the claim moves to the second stage within the "Disclosure of Claim" phase: the engineer's initial response (sub-clause 20.2.2). In this stage, the engineer can issue a notice to the claimant within 14 days after the receipt of the notice of claim if he considers that the claimant failed to issue the notice of claim within the 28 day-period (scenario A.2). If the engineer fails to

give such notice within 14 days, then the notice of claim shall be deemed to be a valid notice (scenario A.3). As such, if the other party disagrees with the established validity of the notice of claim, the other party shall give a notice to the engineer, including details of such disagreement (scenario A.4). Since sub-clause 20.2.2 “Engineer’s initial response” does not specify a time-bar for issuing a notice of disagreement by the other party, it was inferred that the other party can submit a notice of disagreement at any time prior to the submission of a fully detailed claim by the claimant, which is the final stage of the “disclosure of claim” phase.

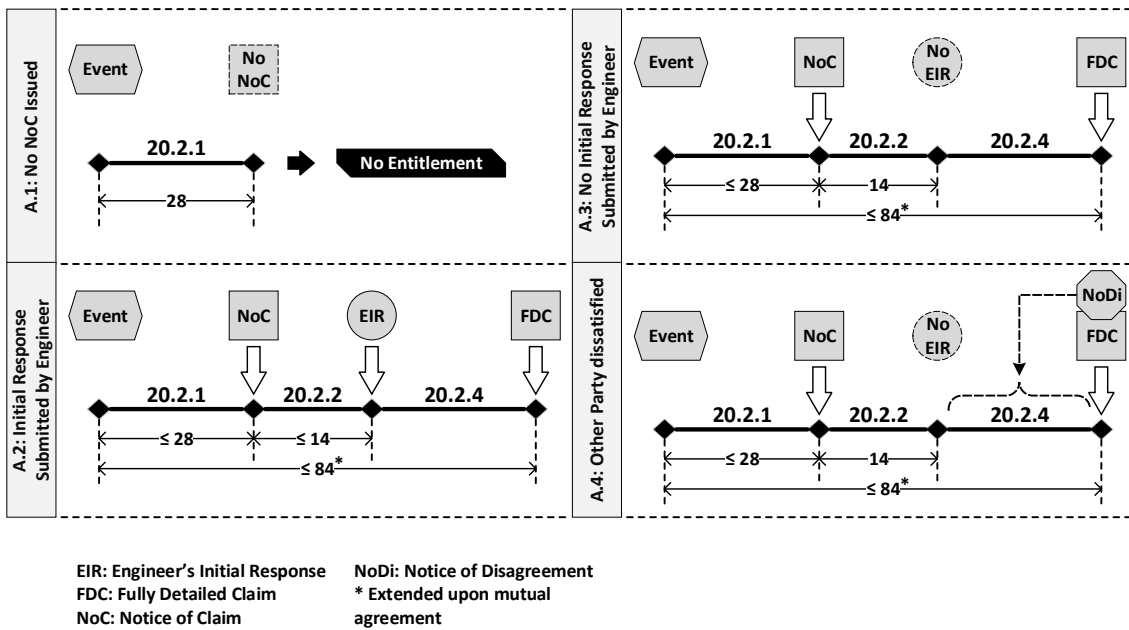


Figure 31. Disclosure of Claims

Regardless of the engineer's initial response, the claimant has to submit a fully detailed claim within 84 days after the claimant became aware or should have become aware of the event or circumstance giving rise to the claim. Sub-clause 20.2.4 "Fully detailed claim" specifies that the 84 day-period can be extended to any other period if requested by the claimant and agreed by the engineer. A fully detailed claim is a submission which includes: "(a) a detailed description of the event or circumstance giving rise to the Claim, (b) a statement of the contractual and/or other legal basis of the Claim, (c) all contemporary records on which the claiming Party relies, and (d) detailed supporting particulars of the amount of additional payment claimed (or amount of reduction of the Contract Price in the case of the Employer as the claiming Party), and/or EOT claimed (in the case of the Contractor) or extension of the DNP claimed (in the case of the Employer)."

Among the four components of the fully detailed claim, sub-clause 20.2.4 specifically sheds light on the contractual and/or other legal basis, referred to in subparagraph (b). The following two cases include the possibility of a contractual and/or other legal basis not being submitted within the stipulated period of 84 days; these two cases take place if: (1) the claimant failed to submit a fully detailed claim, or (2) the claimant submitted an incomplete fully detailed claim, that lacks the contractual and/or other legal basis. In either case, the engineer shall issue a notice to the claimant accordingly within a period of 14 days after the expiry of the 84 day-period. At this stage, the notice of claim is considered to have lapsed and shall no longer be considered

a valid notice. Accordingly, the claim will be on hold, and the claimant will no longer be able to ask for the claimed entitlement. However, the claimant might disagree with such notice or might have valid reasons that justify the late submission of contractual and/or other legal basis. As such, the claimant can submit another fully detailed claim accompanied with the claimant's disagreement or justification for the late submission. Accordingly, the claim process will be reinitiated where the claim moves to the next phase: the "Engineer's Consultation". This case is illustrated in scenario B.1 as presented in Figure 32.

If the engineer fails to give a notice regarding the lack of the contractual and/or other legal basis, the notice of claim becomes a valid notice. Nevertheless, the other party can give a notice to the engineer, including full details, if the other party disagrees with such deemed valid notice of claim (scenario B.2). The time allowed for the other party to issue such notice is not stipulated in sub-clause 20.2.4. Knowing that the acknowledgment of the claim, or lack thereof, shall include a review by the engineer of the other party's disagreement, it was inferred that the other party can submit such notice at any time prior to the end of the agreement phase.

b. Engineer's Consultation

Once the engineer receives the fully detailed claim, the claim process proceeds to the consultation phase, where the engineer consults with both contracting parties jointly or individually. The engineer shall encourage the contracting parties to initiate discussions in an endeavor to reach agreement. Sub-clause 3.7.3 "Time limits" stipulates that the

consultation phase can span up to 42 days from the date the engineer receives the fully detailed claim, or any other period proposed by the engineer and agreed to by the contracting parties.

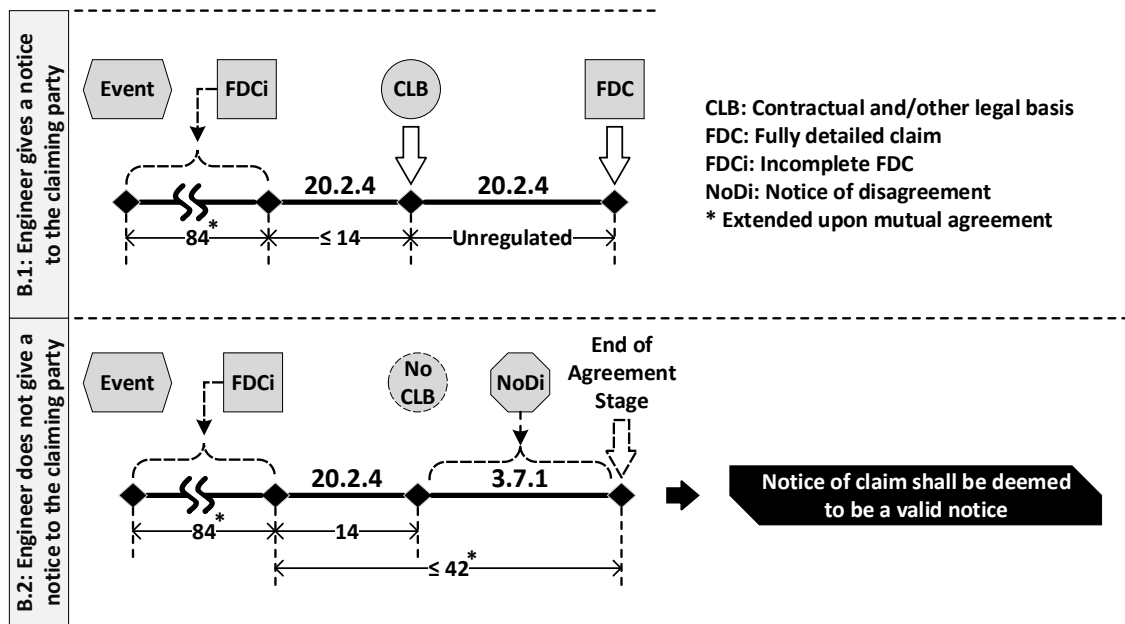


Figure 32. Fully Detailed Claim Lacking Contractual and/or Other Legal Basis

If agreement was reached within the allocated period, the engineer shall issue a notice of agreement to both parties. Otherwise, the engineer shall give a notice to the parties and proceed to the determination phase. This stage can either be reached if no agreement takes place within the stipulated time, or if the contracting parties inform the engineer that no agreement can be reached within the allocated time. All these possibilities are summarized in scenario C.1, as illustrated in Figure 33.

If the engineer fails to issue a notice of agreement or a notice to proceed to the determination phase within the stipulated period (42 days), the engineer is deemed to have rejected the claim (sub-clause 3.7.3 “Time limits”). As a result, the claim skips the determination phase and moves directly to adjudication.

On the other hand, if the engineer receives a fully detailed claim and requires necessary further particulars, the engineer shall: (1) promptly request additional particulars and (2) give a response addressing the contractual and/or other legal basis provided (scenario C.2). Sub-clause 20.2.5 “Agreement or Determination of the Claim” does not stipulate a time limit for the aforementioned actions. However, the engineer shall execute that action within a period of 42 days due to the fact that the submitted fully detailed claim triggers the time-bar for consultation and inaction on behalf of the engineer renders a rejection of the claim. For this reason, it is inferred that the time limit for additional particulars-related actions is 42 days. Once the engineer requests additional particulars, the claiming party shall furnish such particulars as soon as practicable. Under that circumstance, the consultation phase is triggered upon receipt of the additional particulars. Afterwards, the claim progresses in a similar manner to what is discussed under scenario C.1.

c. Engineer’s Determination

Under this phase, the engineer shall make a fair determination of the claim within a period of 42 days (scenario D.1). The corresponding time-bar is triggered once the

engineer issues a notice of proceeding to determination at the end of the consultation phase. The “Notice of Engineer’s Determination” is then given by the engineer to describe the determination in detail and to provide pertinent supporting particulars. The engineer’s determination is binding to both parties unless and until it is revised under clause 21 “Disputes and Arbitration”. On the other hand, if the engineer fails to issue a “Notice of Engineer’s Determination” pursuant to sub-clause 3.7.2 within the stipulated time-bar, the engineer is considered to have rendered a determination rejecting the claim (scenario D.2). These scenarios are illustrated in Figure 34.

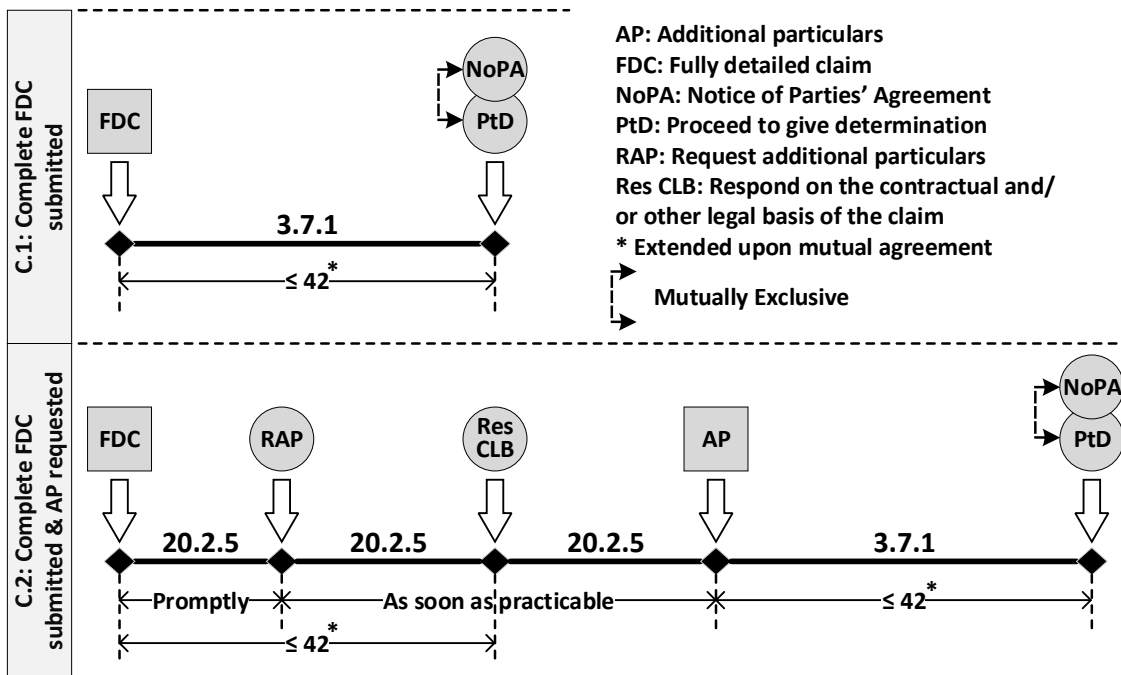


Figure 33. Consultation Phase: Engineer issuing a notice prior to the expiry of the consultation’s time-bar

Within 14 days after the issuance of the engineer’s agreement or determination, the engineer and contracting parties should look for any error of a typographical, arithmetical or clerical nature in the agreement or determination. If the engineer found any error, he/she shall immediately inform the contracting parties. On the other hand, if a contracting party found an error, that party shall give a notice to the engineer identifying the error found and stating that the notice is given under sub-clause 3.7.4 “Effect of the agreement or determination”. In either case, the engineer shall within 7 days of finding the error give a notice to the contracting parties of the corrected agreement or determination. As such, the corrected agreement or determination shall be treated as the agreement or determination rendered by the engineer.

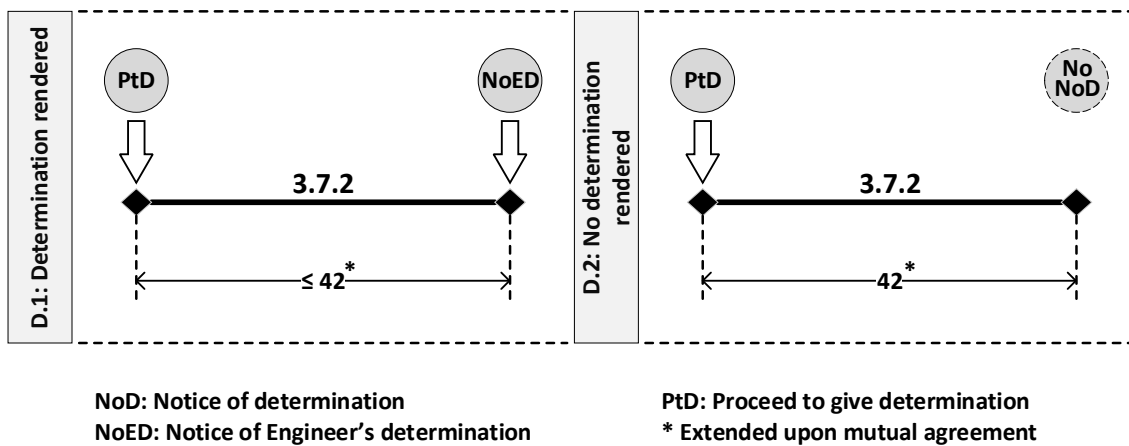


Figure 34. Notice of Engineer's Determination

A binding determination is produced with a possibility of becoming final. If either party was not satisfied with the rendered determination, that party shall issue a notice of dissatisfaction within 28 days from the date the determination was made. Otherwise, the determination becomes final and binding with no possibility of being revoked (scenario E.1, Figure 36). Once a party issues a notice of dissatisfaction, the claim escalates to the level of a dispute. Consequently, disputes shall be escalated to and decided by a dispute avoidance/adjudication board (DAAB).

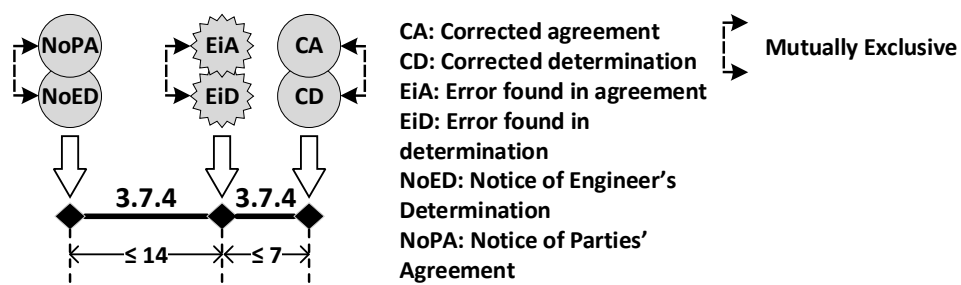


Figure 35. Correction of Errors

In addition to the issuance of a notice of dissatisfaction, the dissatisfied party also needs to refer the dispute to the DAAB within 42 days from the date the notice of dissatisfaction was issued (scenario E.2). On the other hand, if a party issues a notice of dissatisfaction and fails to refer the dispute to the DAAB within the stipulated time, the notice of dissatisfaction is considered to be lapsed and no longer in effect. As such, the determination of the engineer becomes final and binding (scenario E.3).

It is worth mentioning that a party can issue a notice of dissatisfaction for a part of the determination. As such, the dissatisfaction of that part proceeds to the next stages while the other part of the determination becomes final and binding.

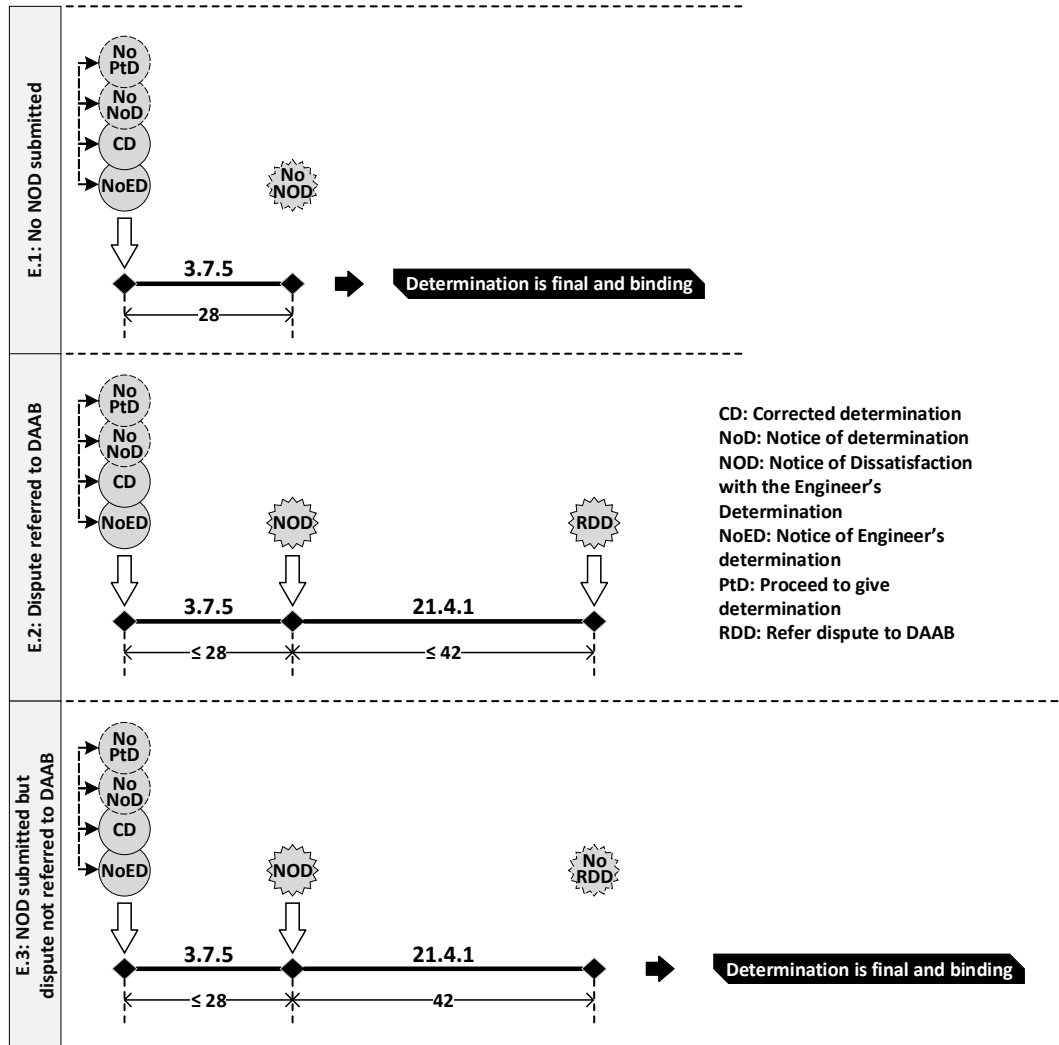


Figure 36. Referring Disputes to DAAB

d. Adjudication

All disputes referred to adjudication shall be decided by a full-term DAAB. Contracting parties shall mutually appoint the DAAB's member(s) within the stipulated period in the contract after the date the contractor receives the letter of acceptance. The DAAB shall be composed of a sole qualified member or three qualified members (Clause 21.1 "Constitution of the DAAB"). In the case of a sole member, that member shall be chosen from the list of members named in the contract data. In case the DAAB will comprise three members, each party chooses one-member conditional to the other party's agreement. Based on the consultation of the parties with the members, a third member is then appointed to act as a chairperson.

The 4 possibilities that could emerge under this phase are presented in Figure 37. Upon referring the dispute to the DAAB, it shall complete and render a decision within 84 days from receiving the referred dispute, or within any other period that is proposed by the DAAB and approved by the contracting parties. The decision shall be in writing and given to both parties with a copy to the engineer. The decision shall be binding to both parties unless and until revised under sub-clause 21.6 "Arbitration". Moreover, the decision turns final and binding if neither party issued a notice of dissatisfaction within 28 days after the date the decision was rendered (scenario F.1). The notice of dissatisfaction, titled as a "Notice of Dissatisfaction with the DAAB's Decision" shall be given to the other party with a copy to the DAAB and the Engineer

and should include the disputed matter and all the reasons for dissatisfaction. The notice of dissatisfaction is a condition precedent to the next phase: amicable settlement.

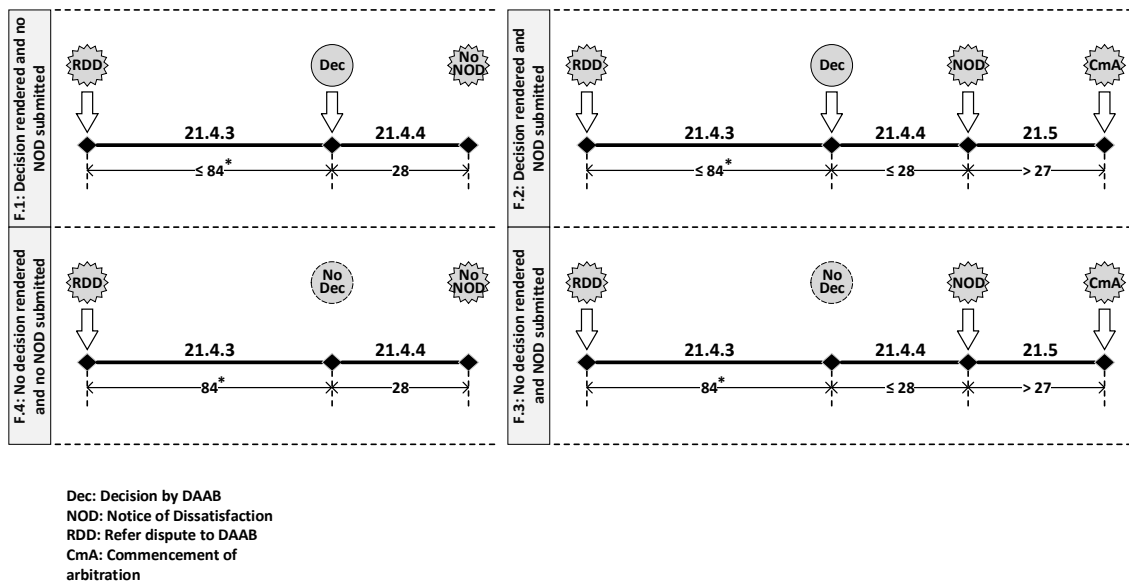


Figure 37. Adjudication Process

The amicable settlement phase is triggered by a notice of dissatisfaction, where the contracting parties shall endeavor to resolve disputes amicably prior to commencing arbitration (sub-clause 21.5 “Amicable Settlement”). If no dispute resolution was reached, either party can commence arbitration by the 28th day after the date the notice of dissatisfaction was issued (scenario F.2). Similarly, if the DAAB fails to give a decision within the stipulated period, either party may issue a notice of dissatisfaction to proceed to amicable settlement (scenario F.3). Otherwise, the parties will not be able to

attempt amicable settlement and will have to eventually pursue arbitration (scenario F.4).

Similar to the outcomes of a notice of dissatisfaction with the engineer's determination, either party may issue a notice of dissatisfaction with parts of the DAAB's decision. As such, the other parts of the DAAB's decision become final and binding as if no notice of dissatisfaction was issued.

4. Claim Process Evolution Flowchart

When looking at all the possible scenarios that could prevail under each phase of the claim/dispute resolution mechanism, it is clear that numerous paths of claim evolution could evolve. As such, there is a need to have an all-inclusive model that combines all claim/dispute evolution paths. For this reason, a comprehensive flowchart is designed and illustrated in Figure 38.

Failure to issue a notice of claim upon starting the claim initiation process, within the stipulated period, disqualifies claimants from receiving any entitlements such as additional time and/or money. Otherwise, the claim proceeds to the "Engineer's Initial Response" stage, where the engineer has the option to suspend the process upon issuance of a notice, indicating that the claimant failed to issue the notice of dissatisfaction. If the engineer did not act as such, the other party has the option to issue a notice of disagreement with engineer's inaction. Regardless of the submission of a notice by the engineer or the other party or lack thereof, the claimant can submit a fully

detailed claim within a period of 84 days from the date the notice of claim was submitted. Once the engineer receives the fully detailed claim, the engineer shall check for contractual and/or other legal basis. If found missing, the engineer shall wait until the expiry of the submission time-bar of the fully detailed claim. If the contractual and/or other legal basis was submitted along with the fully detailed claim at any time prior to the expiry of the relevant time-bar, the claim moves to the “Agreement” stage. Otherwise, the claim moves to the “Engineer’s CLB Notice” stage, where the engineer shall issue a notice to the claimant indicating that the contractual and/or other legal basis is missing. As such, the claim enters an unregulated period unless and until the claimant submits the contractual and/or other legal basis accompanied with a valid reason for late submission or the claimant informs that he/she disagrees with the engineer’s notice regarding this matter. Consequently, the claim moves to the “Agreement” stage. Moreover, the process could reach this stage if the engineer failed to issue a notice regarding the contractual and/or other legal basis, in which case the notice of claim is deemed valid. However, the other party can, in that case, issue a notice of disagreement with the notice acknowledging the claim as valid. Once the claim reaches the “Agreement” stage, the engineer shall inspect the submitted particulars and check if additional ones shall be requested. If that was the case, the engineer shall request further particulars promptly and the claimant shall furnish additional particulars as soon as possible.

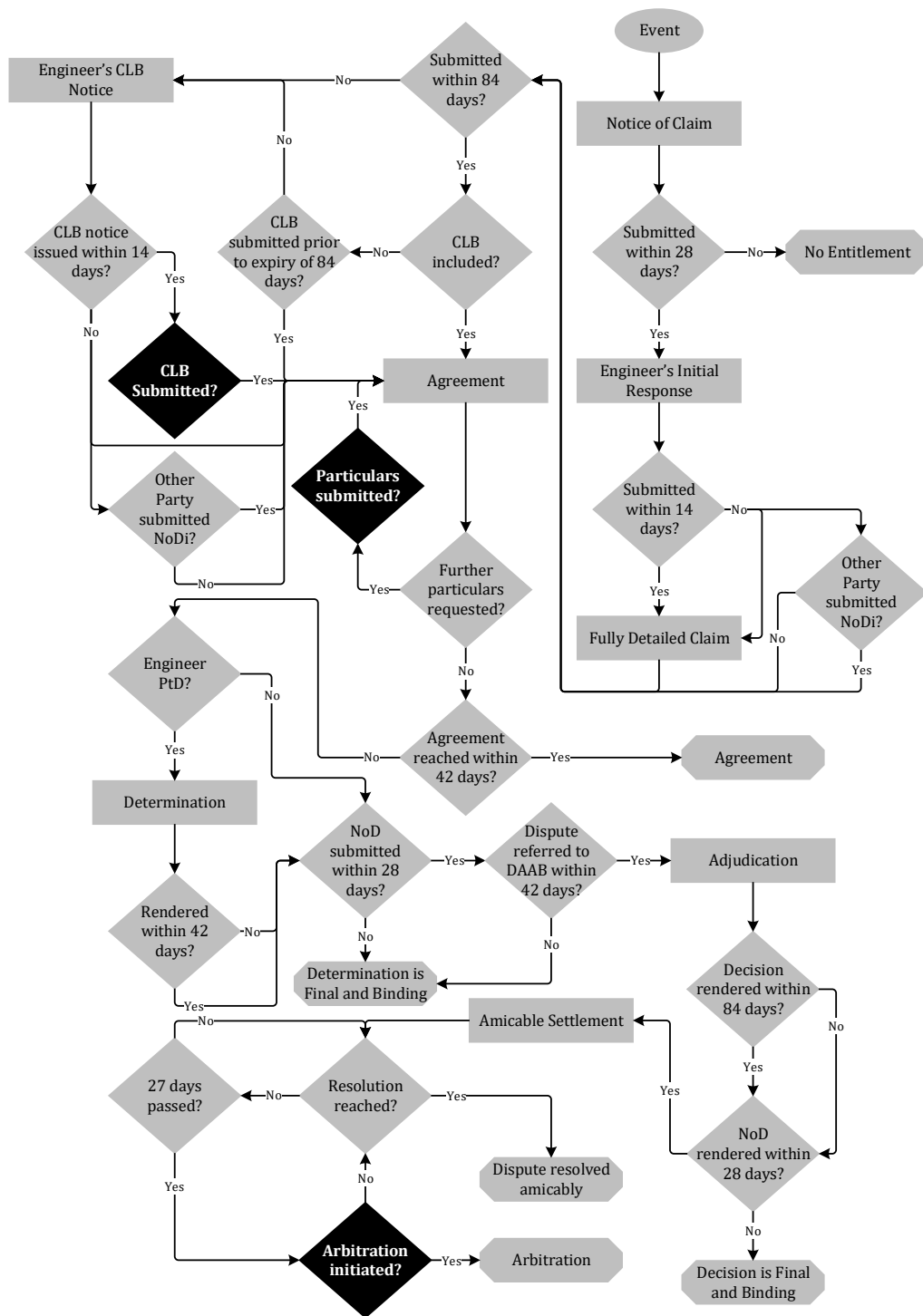


Figure 38. Claim Process Flowchart

Once the additional particulars have been submitted, the claim re-enters the “Agreement” stage and triggers the pertinent time-bar of 42 days. If agreement was reached within that period, the claim moves to the “Agreement” endpoint where the process terminates. On the other hand, if an agreement was not reached or if the parties inform the engineer that an agreement cannot be reached, the engineer shall issue a notice to the contracting parties to proceed to the determination stage. Afterwards, the claim can either move to the “Determination” stage upon submission of the notice by the engineer, or to the notice of dissatisfaction node, given that the engineer has rejected the claim explicitly or by inaction. In the determination phase, the claim moves to the notice of dissatisfaction node whether a determination was rendered or not. This is due to the fact that the failure of the engineer to give a determination is considered symmetrical to rendering a determination of claim rejection. At the notice of dissatisfaction node, the failure to submit that notice within a period of 28 days moves the claim to the “Determination is Final and Binding” endpoint. Otherwise, the claim moves to the next node, where the dispute could proceed to DAAB within 42 days from the date of submitting the notice of dissatisfaction. The failure to do so moves the dispute to the “Determination is Final and Binding” endpoint”. The other outcome of the referral node is to the “Adjudication” stage, where the DAAB renders a decision regarding the referred dispute within a period of 84 days. Regardless of the finalization of a decision or lack thereof, the claim moves to the notice of dissatisfaction node, where either party may issue a notice of dissatisfaction to move the claim to the

“Amicable Settlement” stage and, eventually, to the “Arbitration” endpoint. In the case where a decision is rendered by the DAAB with no notice of dissatisfaction issued, the claim moves to the “Decision is Final and Binding” endpoint, where the process is terminated. On the other hand, the dispute under the “Amicable Settlement” stage can either move to the “Dispute resolved amicably” endpoint if resolved any time within 28 days from the date the notice of dissatisfaction with DAAB decision was submitted or move to “Arbitration” endpoint otherwise.

5. Discussion

The conducted particularized analysis illustrated an array of possibilities and process pathways along which claims/disputes could evolve. Other than the claim/dispute timeline, the thorough analysis revealed several observations pertaining to the role of the engineer and the full-term dispute avoidance/adjudication board. This section highlights these observations and offers a detailed comparison of the claim/dispute resolution mechanism between the second latest set of conditions, FIDIC 1999, and the most newly released one, FIDIC 2017.

a. The Engineer

As stipulated under sub-clause 1.1 “Definitions”, the engineer is a third party appointed by the employer and named in the contract to act as the engineer for the purposes of the contract. As such, sub-clause 3.2 “Engineer’s Duties and Authority” specifies that the

engineer shall be deemed to act for the employer's benefit when carrying out any duties or exercising any authority specified in or implied by the contract, except where otherwise stated in other conditions.

Under the second latest set of conditions, the same rule applies, where sub-clause 3.5 "Determination" does not state otherwise. As such, the engineer is not required to act impartially when carrying out duties pursuant to the relevant clause. However, sub-clause 3.7 "Agreement and Determination", under the newly released set of conditions, stipulates that the engineer shall act neutrally between the parties. Hence, the engineer shall not be deemed to act for the employer's benefit when consulting with both parties or when rendering determinations regarding submitted claims. This capacity, under which the engineer shall act, pursuant to sub-clause 3.7 "Agreement and Determination", is one of the dramatic modifications that was introduced in the newly released set of conditions. Here, an intuitive concern is raised as to how the engineer would act neutrally when, in reality, the engineer is officially hired by the employer's organization and receives payments from the employer accordingly. To this end, a study by Barakat et. Al (2018) argued that the judgment rendered shall be based on facts and evidences and shall not be influenced by personal feelings. Moreover, the engineer shall be guided by the following principles when exercising this role: objectivity, professionalism, due diligence, and standard of care.

b. Full-term Dispute Avoidance/Adjudication Board

The adjudication stage is one of the crucial gates in the claim/dispute mechanism, through which the dissatisfied party with the engineer's determination seeks a DAAB's decision prior to proceeding to arbitration. Under the second latest set of conditions, the dissatisfied party had the option of referring a matter to adjudication at any point in time. Therefore, there was a possibility of having an ad-hoc dispute adjudication board (DAB), rather than having a full-term one. However, the newly released set of conditions regulated the referral mechanism of disputes to adjudication, where it specifies that the dissatisfied party with engineer's determination shall issue a notice of dissatisfaction and refer the dispute to adjudication within a stipulated period of time. As such, a full-term DAAB shall be present so that it could decide on any referred matter. In fact, sub-clause 21.1 "Constitution of the DAAB" supports this argument and specifies that the DAAB shall be chosen within 28 days from the contractor's receipt of the letter of acceptance, or any other period stated in the contract.

c. FIDIC 1999 versus FIDIC 2017

The newly released set of conditions introduced various changes to the claim/dispute resolution mechanism pertaining to (1) disclosure of claims, (2) engineer's consultation and determination, (3) referral of disputes to adjudication, and (4) amicable settlement.

i. Disclosure of claim

Under the second latest set of conditions, the claimant has to issue a notice of claim and furnish supporting documents within 28 days and 42 days respectively, where both time-bars are triggered from the date the claimant becomes aware or should have become aware of the event or circumstance giving rise to the claim. Similarly, a claim under the newly released set of conditions is initiated upon submitting a notice of claim within 28 days from the date the claimant becomes aware or should have become aware of the event or circumstance giving rise to the claim. However, prior to the submission of the fully detailed claim, the engineer has the chance to judge the validity of the notice of claim by checking if the notice was submitted within the stipulated time-bar. In this regard, a period of 14 days is allocated for the engineer to issue an initial response. Regardless of outcome of the engineer's response (if any), the claimant can submit a fully detailed claim within 84 days from the date the claimant becomes aware or should have become aware of the event or circumstance giving rise to the claim. Hence, it can be noticed that the claimant is offered double the period to submit the fully detailed claim when compared to that of the previous set of conditions. This modification is illustrated in Figure 39.

ii. Engineer's Consultation and Determination

Figure 40 illustrates the modifications introduced to the underlying engineer's duties regarding the phases of consultation and determination. Under both sets of conditions,

the engineer shall, upon receipt of a fully detailed claim, consult with both parties to attempt reaching agreement. Upon the failure, the engineer shall proceed to give a determination regarding the submitted claim.

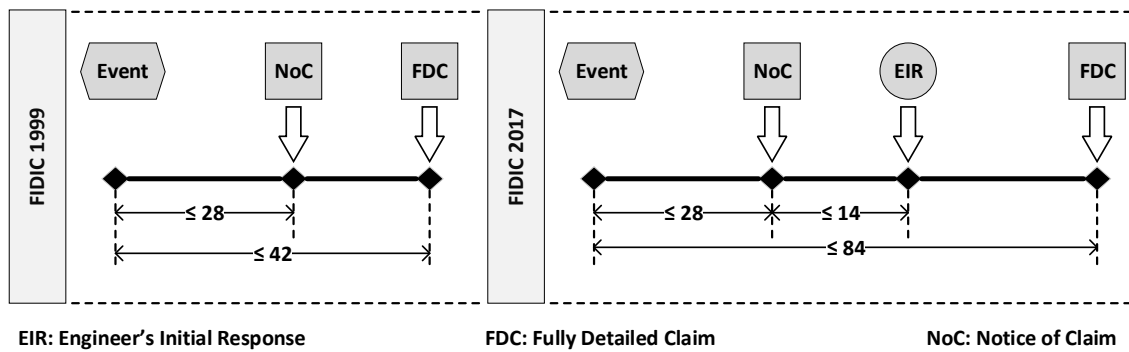


Figure 39. Modifications of the Disclosure of Claims

Under FIDIC 1999, then engineer had to carry out both duties within a single time-bar of 42 days, as illustrated in Figure 40. However, the newly set of conditions allocated a time-bar of 42 days for each of the two duties: consultations and determinations. To this end, it is worth mentioning that the engineer is allocated a total maximum period of 84 days, equivalent to that allocated for the claimant to submit claims. As such, it can be argued that the new underlying claim/dispute mechanism has an objective of fairly allocating equivalent time-bars for both parties at both phases: claim disclosure and the engineer's consultation and determination.

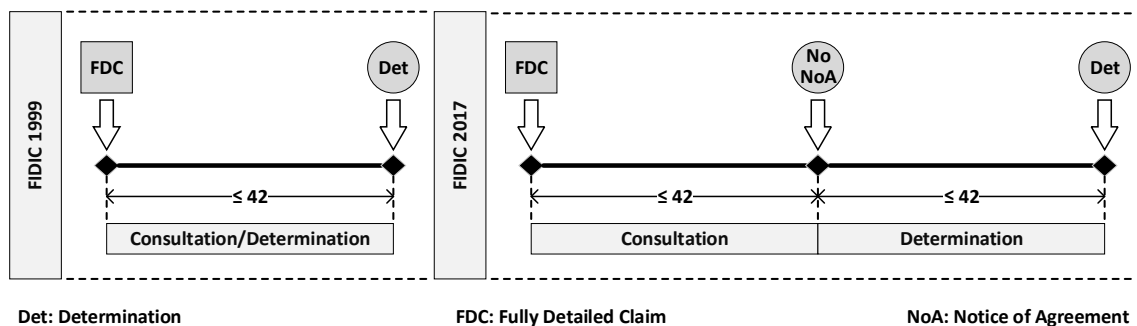


Figure 40. Modifications of the Engineer's Consultation and Determination

iii. Referral of Disputes to DAAB

One of the major concerns of the claim/dispute resolution mechanism stipulated under FIDIC 1999 was the unregulated period falling between the issuance of the engineer's determination and the referral of the dispute to adjudication, shown in Figure 41. In fact, the corresponding clauses did not specify a time-bar for the dissatisfied party with the engineer's determination to refer the dispute to adjudication. Keeping this period as unregulated hindered claims' progression by dragging on its resolution over a rather undesirably long period of time. To resolve this dilemma, the newly released set of conditions regulated this period by (1) allocating a period of 28 days for either party to issue a notice of dissatisfaction regarding the engineer's determination and (2) enforcing the dissatisfied party to refer disputes to adjudication within 42 days from the date the notice of dissatisfaction was issued. Otherwise, the engineer's determination turns final and binding, thereby concluding the claim/dispute resolution process.

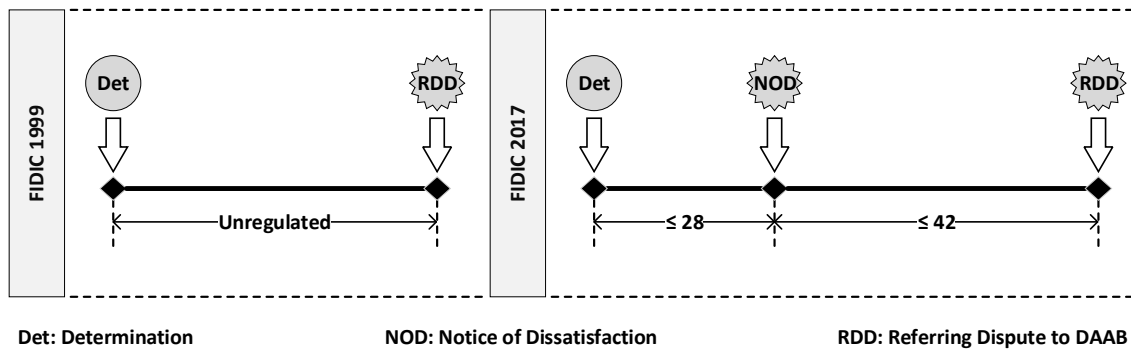


Figure 41. Modifications of the Referral of Disputes to Adjudication

iv. Amicable Settlement

Whenever a party is dissatisfied with the DAAB's decision, that party shall issue a notice of dissatisfaction to trigger the initiation of the amicable settlement period. The latter is a condition precedent to arbitration, where arbitration can be commenced at any time after the expiry of the amicable settlement's period. Under FIDIC 1999, either party can commence arbitration on or after the 56th day of the amicable settlement phase. However, this period was decreased under the newly released set of conditions, where either party can initiate arbitration on or after the 28th day of the amicable settlement phase. This modification allows the early commencement of arbitration while maintaining the option of deferring this procedure through mutual agreement of both parties.

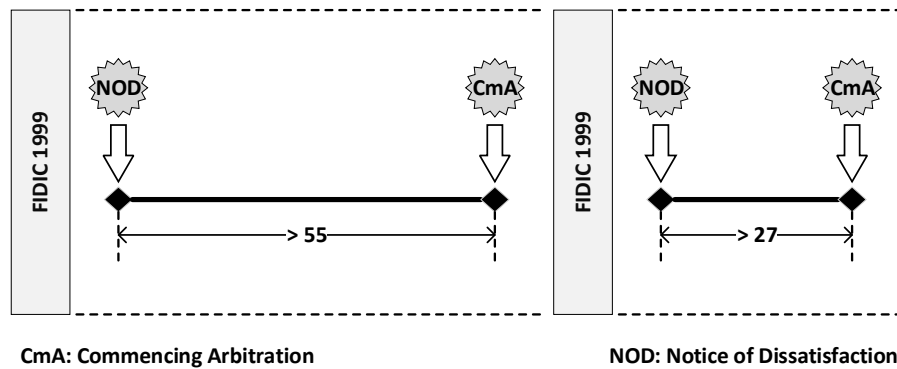


Figure 42. Modifications of the Amicable Settlement Phase

F. NEC Claim/Dispute Resolution Mechanism

This section studies the underlying claim/dispute resolution mechanism stipulated under the NEC construction contract conditions with the aim of exploring all the possible scenarios that could be encountered under the claim/dispute evolution process. Moreover, a guiding map summarizing the spectrum of scenarios is developed to help practitioners and contracting parties better administer this process. A thorough analysis of the underlying mechanism exposed a number of findings pertaining to: (1) the role of the project manager as compared to that of the engineer under FIDIC construction contract conditions, (2) the consequences of the project manager’s inactions, (3) the indirect use of notification of failure, (4) the impact of adopting option W1 for adjudication versus option W2, and (5) the absence of rooms to adopt any of the alternative dispute resolution techniques.

1. Research Methodology

To achieve the aforementioned objectives, the methodology below was adopted and it includes: (1) meticulous examination of Clause 6 “Compensation event” and “Options W1 and W2”, (2) extraction of the schematic claim/dispute resolution timeline, (3) formulation of all the possible scenarios that are likely to be encountered, and (4) development of a comprehensive flowchart that combines all the formulated scenarios.

2. Underlying Claim/Dispute Mechanism

Different types of conflicts can occur between the contracting parties during the course of a construction project. To resolve these conflicts, the contracting parties governed by an NEC contract shall follow the underlying claim/dispute mechanism set forth in the NEC conditions. This mechanism, illustrated in Figure 43, is divided into two parts: the compensation event and the dispute resolution.

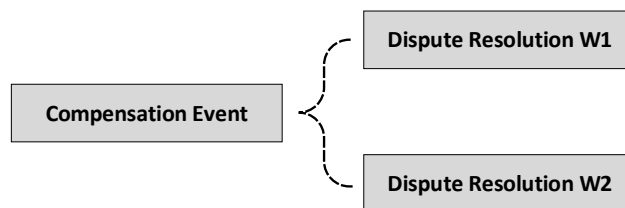


Figure 43. Claim/Dispute Mechanism

In order to initiate a claim under Clause 6 “Compensation event”, the event giving rise to the claim must be included under the compensation events detailed under sub-clause 60 “Compensation events”. Compensation events can arise from the project manager, a party appointed by the employer to manage the contract on his behalf, or the supervisor issuing a certificate, giving a notice, correcting an assumption or changing an earlier decision. For such events, the project manager notifies the contractor of the compensation event and instructs the contractor to submit a quotation, unless the quotation has already been submitted or the event arises due to the contractor’s fault. On the contrary, the contractor must notify the project manager of the compensation event if (1) the event occurring is classified as a compensation event, and (2) the project manager has not notified the contractor of the event. As such, the project manager decides if the contractor is entitled for a change in the prices, the completion date, and/or the key dates and, instructs the contractor to submit a quotation accordingly. Finally, the project manager replies to the submitted quotation within a stipulated period. The described global mechanism of the compensation event is illustrated in Figure 44.

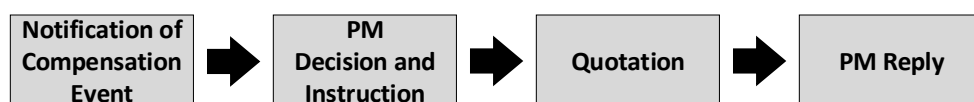


Figure 44. Compensation Event Mechanism

Unresolved compensation events that evolve into disputes have to be processed in accordance with the dispute resolution mechanisms set forth in the “Main Option” clause “DISPUTE RESOLUTION”. The NEC conditions offer two options under the aforementioned clause, option W1 and option W2, as illustrated in Figure 45. The contracting parties shall follow the dispute resolution procedure stipulated in option W1 unless the United Kingdom Housing Grants, Construction and Regeneration Act 1996 applies.

To trigger the mechanism under option W1, the contractor has to issue a notification of dispute to the employer and to the project manager within four weeks from the arise of the dispute. Following the notification, the contractor refers the dispute to adjudication including any pertinent information to be considered by the adjudicator. In parallel, both the contractor and the employer can submit any other relevant information to be considered by the adjudicator within a stipulated period. Upon receipt of all the information, the adjudicator renders a decision and notifies both parties and the project manager of that decision. Eventually, if one of the contracting parties is dissatisfied with the adjudicator’s decision, that party issues a notice of dissatisfaction to the other parties informing them of the intention to refer the matter to the tribunal.

On the other hand, the contracting parties may alternatively follow the dispute resolution procedure under option W2, which is fundamentally similar to that of option W1, if the United Kingdom Housing Grants, Construction and Regeneration Act 1996

applies. However, this procedure does not stipulate a period for the contracting parties to trigger adjudication as it can happen at any time.

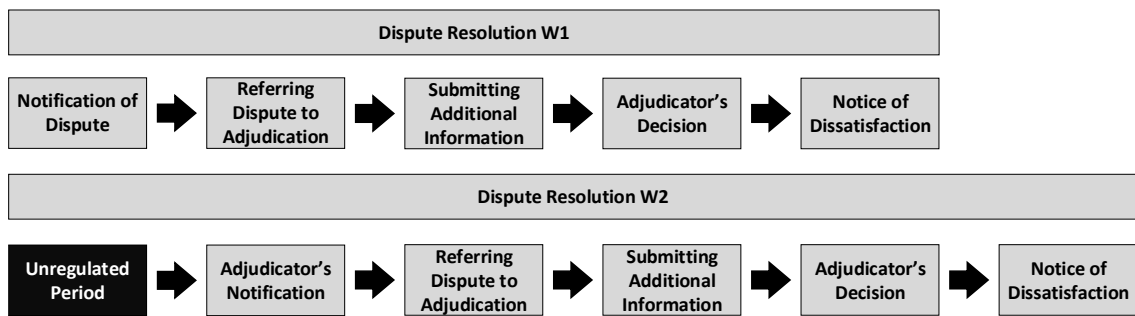


Figure 45. Dispute Resolution

3. Detailed Analysis

As illustrated in Figure 43, the global claim/dispute resolution mechanism is divided into two parts the compensation event and the dispute resolution. In order to explore the possibilities likely to prevail in each part of the claim /dispute mechanism, particularized scenarios were constructed.

a. Compensation Event

The compensation event forms the first part of the claim/dispute resolution mechanism, spanning from the initiation of a claim to the issuance of the project manager's reply. This part includes two sections: the project manager's decision and the project manager's reply. Within each section, the corresponding scenarios were formulated.

As illustrated in Figure 46, three scenarios exist for the section of the project manager's decision. According to sub-clause 61.3, all scenarios show that the contractor submits a notification of the compensation event within 8 weeks from becoming aware of the event. Otherwise, the contractor will not be entitled to a change in prices, completion date, or key dates, unless the event arises from the project manager or the supervisor issuing a certificate, giving a notice, correcting an assumption or changing an earlier decision. Upon receipt of the notice, the project manager shall decide if the contractor is entitled for a change in prices, completion date, and/or key dates within a week. Sub-clause 61.4 states that this period is extendable upon the agreement of the contractor. Scenario 1 depicts the case where the project manager provides the decision to the contractor and instructs the contractor to submit a quotation, if the event was accepted as a compensation event, before the end of the aforementioned period. On the contrary, scenarios 2 and 3 represent the case where the period allocated for the project manager to render the decision expires with no decision notice issued. As such, the contractor may notify the project manager of this failure, and the latter is offered an additional period of two weeks to either render a decision (scenario 2) or stay silent (scenario 3). The failure by the project manager to render a decision, as illustrated in scenario 3, is considered an acceptance of the compensation event and an instruction for the contractor to submit quotations.

Sub-clause 62.3 specifies that the contractor shall submit quotations within three weeks of being instructed by the project manager. Quotations for the compensation

events shall include (1) the proposed changes to the prices, the completion date, and/or the key dates, (2) the detailed assessment of the contractor, and (3) the alterations to the accepted program if it was affected by the compensation event. If there are several practicable methods that could handle the compensation event, the contractor can submit more than one quotation. Once the quotations are submitted, the project manager shall reply within two weeks, as stipulated in sub-clause 62.3. As illustrated in Figure 47, scenario 1 illustrates the case where the project manager either accepts the quotation or rejects it through issuance of a notification stating that a proposed change decision will not be made, nor will a proposed instruction be given. Whereas under scenario 2, the project manager instructs the contractor to submit a revised quotation after explaining the reasons to do so. Accordingly, the contractor shall submit a revised quotation within three weeks from the instruction. Then, the project manager replies within two weeks of the submitted revised quotation. It has to be noted that, upon the agreement of the contractor, the project manager can extend the time allocated for the contractor to submit a quotation and for him to reply to a quotation, as stipulated in sub-clause 62.5.

On the other hand, if the project manager fails to reply to the submitted quotation within the allotted time as shown in scenarios 3 and 4, the contractor can issue a notification of failure. Sub-clause 62.6 clarifies that the contractor must specify in the notification which quotation is to be accepted if more than one was submitted. Henceforth, the project manager will have an additional period of two weeks to reply, as

illustrated in scenario 3. However, the failure of the project manager to reply within this additional allocated time, as presented in scenario 4, is considered an acceptance of the proposed quotation.

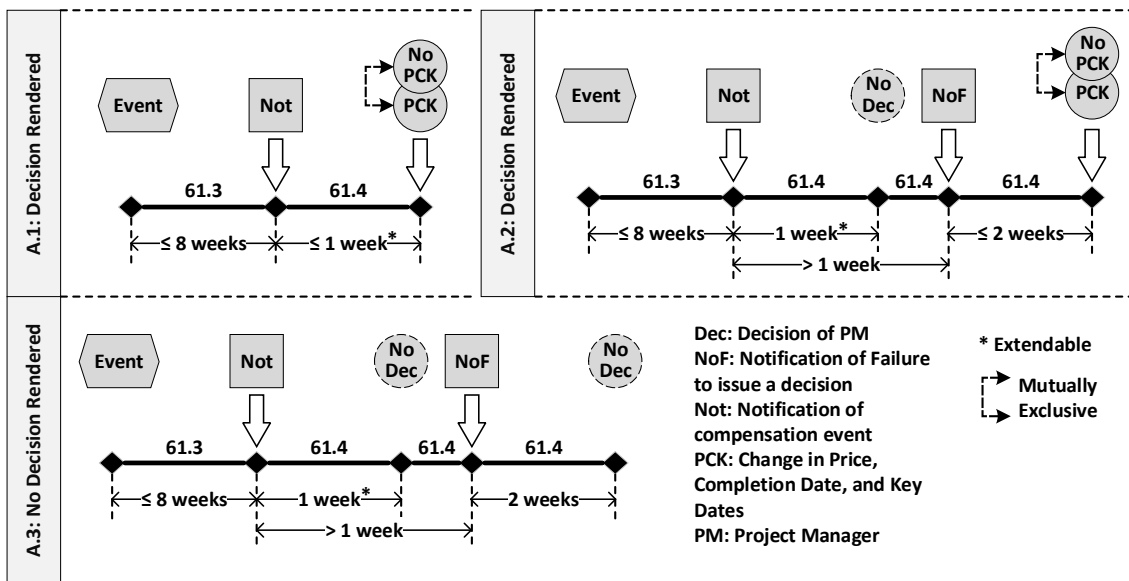


Figure 46. Project Manager's Decision

Beside accepting, rejecting, or instructing the contractor to submit a revised quotation, the project manager may also notify the contractor that he will do his own assessment. According to sub-clause 64.3, the project manager must notify the contractor of his own assessment of the compensation event and its pertinent details within the same period allocated for the contractor to submit the quotation. Therefore, scenario 1 in Figure 48 illustrates that the project manager is given a period of three

weeks to complete his assessment, which is the same period stipulated in sub-clause 62.3 for submitting a quotation.

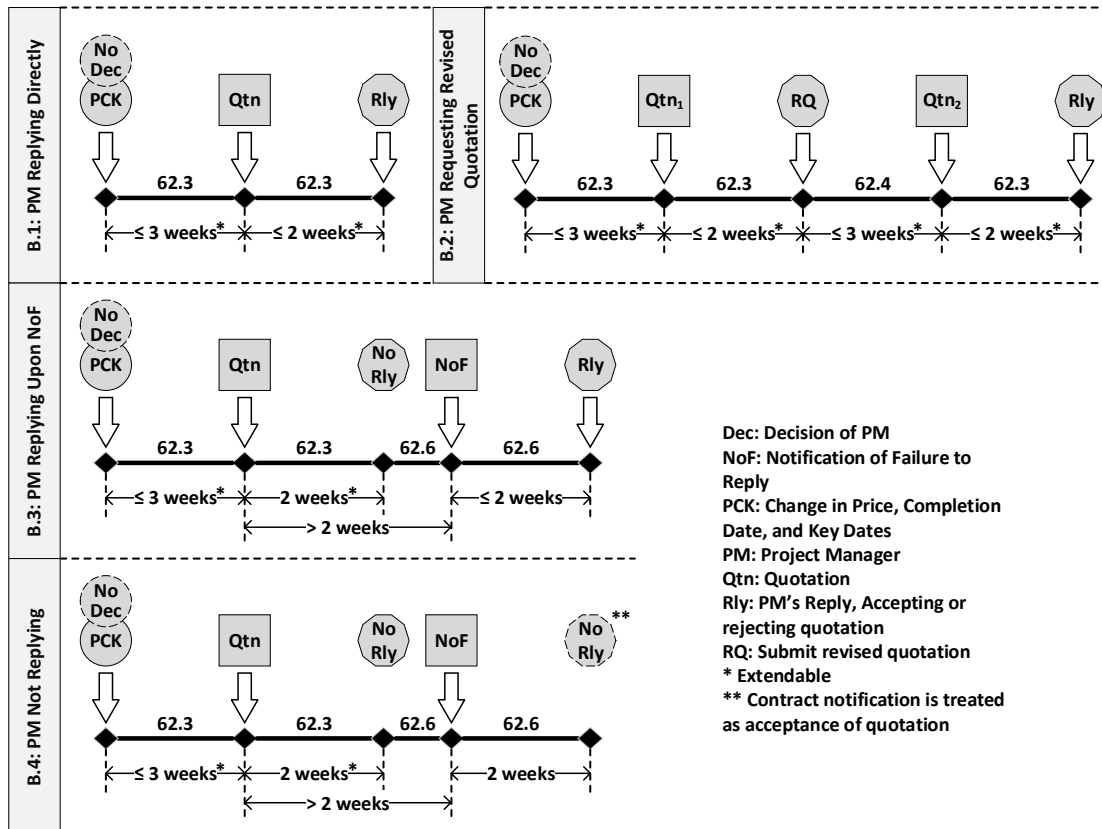


Figure 47. PM Accepting Quotation, Rejecting It, or Instructing to Submit a Revised One

On the other hand, scenario 2 illustrates the case where the project manager fails to submit an assessment within the allowed period. Sub-clause 64.4 hereby states that the contractor can notify the project manager of this failure, and the latter will be offered an additional period of two weeks to submit an assessment. In the notification of

failure, the contractor has to specify the quotation that he proposes if more than one was initially submitted. If the project manager's assessment was not submitted within the allowed period, the proposed quotation of the contractor is thereby accepted.

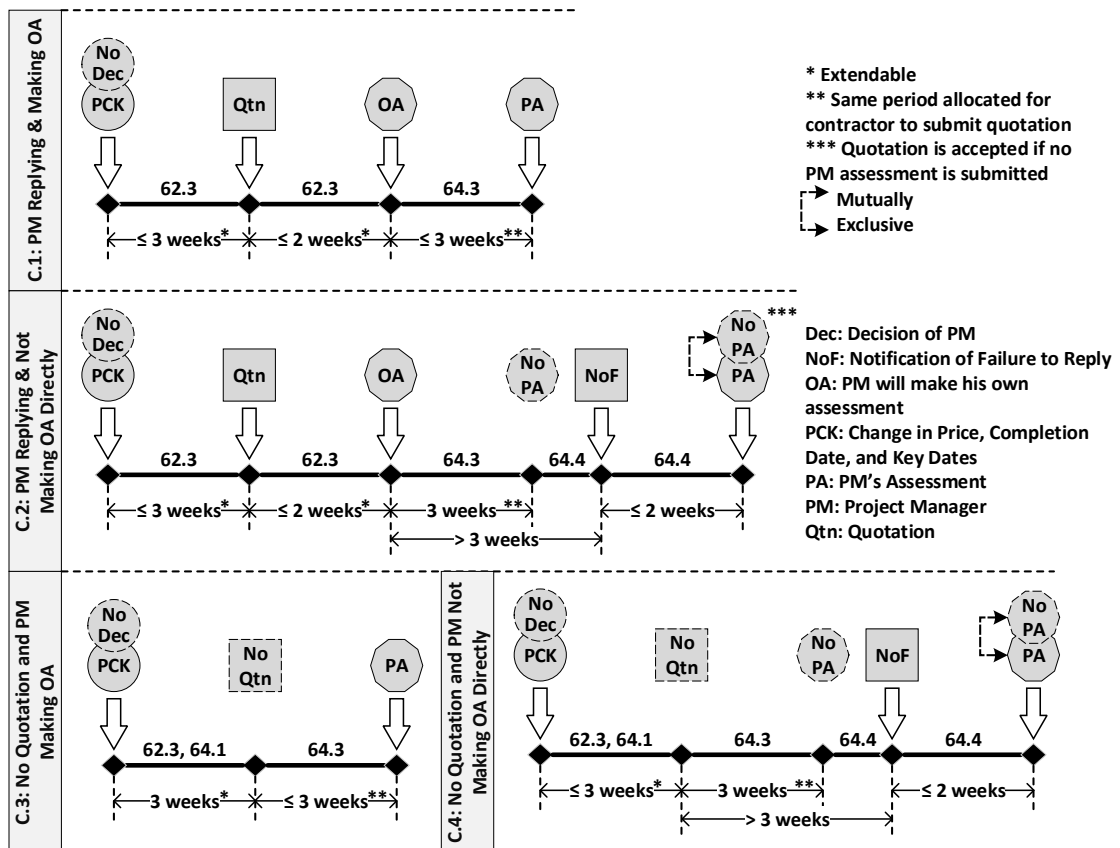


Figure 48. PM Making Own Assessment

b. Dispute Resolution

The general conditions of the NEC contract state that all disputes arising in connection with or under the contract shall be referred to the adjudicator to decide on the matter in

dispute. The adjudicator is an independent third party named in the contract who shall act impartially when rendering decisions regarding the referred disputes. Nevertheless, the adjudicator shall not act as an arbitrator. If the adjudicator was not named in the contract, became unable to act, or resigns, the contracting parties shall mutually appoint an adjudicator. However, if the contracting parties fail to do so, either party may request the adjudicator nominating body to choose an adjudicator. As such, the adjudicator shall be named within four days, and the replacement adjudicator has the power to decide on all disputes that were referred to the previous adjudicator who resigned or was unable to act.

As for compensation events, these matters evolve into disputes when (1) the project manager decides that there will be no change in prices, completion date or key dates, (2) the project manager rejects the quotation of the contractor, (3) the contractor is dissatisfied with the assessment of the project manager, or (4) the employer disagrees with the acceptance of a quotation. In any of the such cases, the contracting parties shall refer the dispute to one of the dispute resolution procedures: option W1 or option W2.

i. Option W1

The underlying dispute resolution procedure, illustrated in Figure 49, is by default the one to which contracting parties must refer unless the United Kingdom Housing Grants, Construction and Regeneration Act 1996 applies. Sub-clause W1.3.1 stipulates that the disputed matter shall be notified within four weeks from discovery and referred to the

adjudicator anywhere between two to four weeks from when the corresponding parties were notified. It is emphasized under sub-clause W1.3.2 that no party may refer a disputed matter to the adjudicator or the tribunal if it had not been notified and referred within the stipulated timelines. However, these timelines can be extended by the project manager upon the agreement of the contractor, prior to the expiry of the period(s) of the notice and/or the referral. Moreover, sub-clause W1.3.3 clarifies that the party referring a dispute to the adjudicator needs to include along with the referral any pertinent information to be considered by the adjudicator. If any contracting party wants to submit further information for consideration by the adjudicator, that information shall be provided within four weeks from the date of referral. Subject to sub-clause W.1.3.5, the adjudicator may instruct a party to take any other action needed to reach a decision and/or to provide further information related to the dispute within a stated period. Although sub-clause W1.3.5 does not impose a time window for the adjudicator to make such instructions, sub-clause W1.3.8 stipulates that he/she shall render a decision regarding the disputed matter within four weeks from the expiry of the period dedicated for receiving information. Therefore, the adjudicator has a period of four weeks to make any instructions, if needed. It has to be noted that this period can be extended upon the mutual agreement of the contracting parties.

The decision of the adjudicator is binding to the contracting parties, unless and until the matter is submitted to and revised by the tribunal. Moreover, the decision is enforced as a contractual obligation and not as an arbitral award. If either party was

dissatisfied with the rendered decision, that party shall issue a notice of dissatisfaction to the other party within four weeks of the adjudicator's issued decision. Otherwise, sub-clause W1.3.10 states that the adjudicator's decision turns final, and sub-clause W1.4.2 clarifies that both parties waive their rights to refer the corresponding matter to the tribunal. On the other hand, if the adjudicator fails to render a decision within the stipulated timeline, either party can notify the other party of the intention to refer the dispute to the tribunal. Subject to sub-clause W1.4.3, this option is only applicable if the notification was made within four weeks from the expiry of the period allocated for the adjudicator to render the decision.

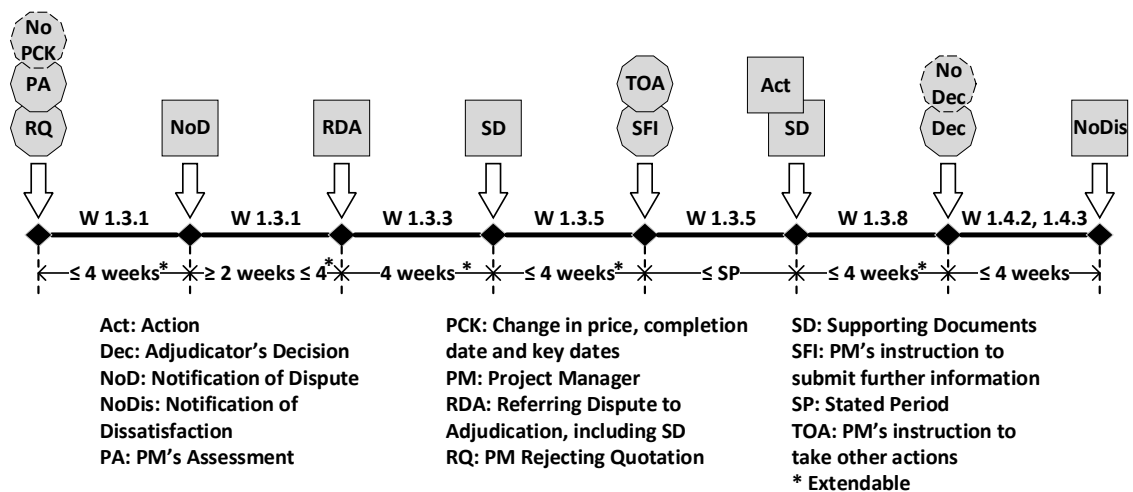


Figure 49. Dispute Resolution W1

ii. Option W2

For projects where the United Kingdom Housing Grants, Construction and Regeneration Act 1996 applies, contracting parties shall follow the dispute resolution procedure set forth in option W2, which is presented in Figure 50. Under this option, disputes arising may fall into an unregulated period, as stated by sub-clause W2.1. In that case parties can refer disputes to adjudication at any time. Prior to referring the dispute to the adjudicator, however, the referring party must issue a notice of adjudication to the other party including a brief description of the dispute and a statement of desired adjudicator decision. Additionally, the referring party must send a copy of the notice to the adjudicator if the adjudicator was named in the contract. Within three days from receiving the notice, the adjudicator shall notify the contracting parties of his/her ability to render a decision regarding the referred dispute, or lack thereof. If the adjudicator was unable to decide on the dispute or did not notify the contracting parties within the stipulated timeline, the adjudicator is considered to have resigned. Henceforth, the contracting parties can appoint an adjudicator mutually or ask an adjudicator nominating body to do so. The chosen adjudicator must be able to decide on the disputed matter. Otherwise, the chosen person should not be appointed to act under this role.

Within seven days of the day the notice of adjudication was issued, the referring party must refer the dispute to the adjudicator and furnish all pertinent information, including supporting documents, to the adjudicator with a copy to the other party. If the

referring party or the other party needs to provide further information to be considered by the adjudicator, that information shall be provided within fourteen days from the day the dispute was referred to the adjudicator. However, this period can be extended upon the consent of both parties and the adjudicator. Similar to option W1, sub-clause W2.3.4 stipulates that the adjudicator may instruct a party to provide further information related to the dispute and/or to take any other action needed to reach a decision within a stated period.

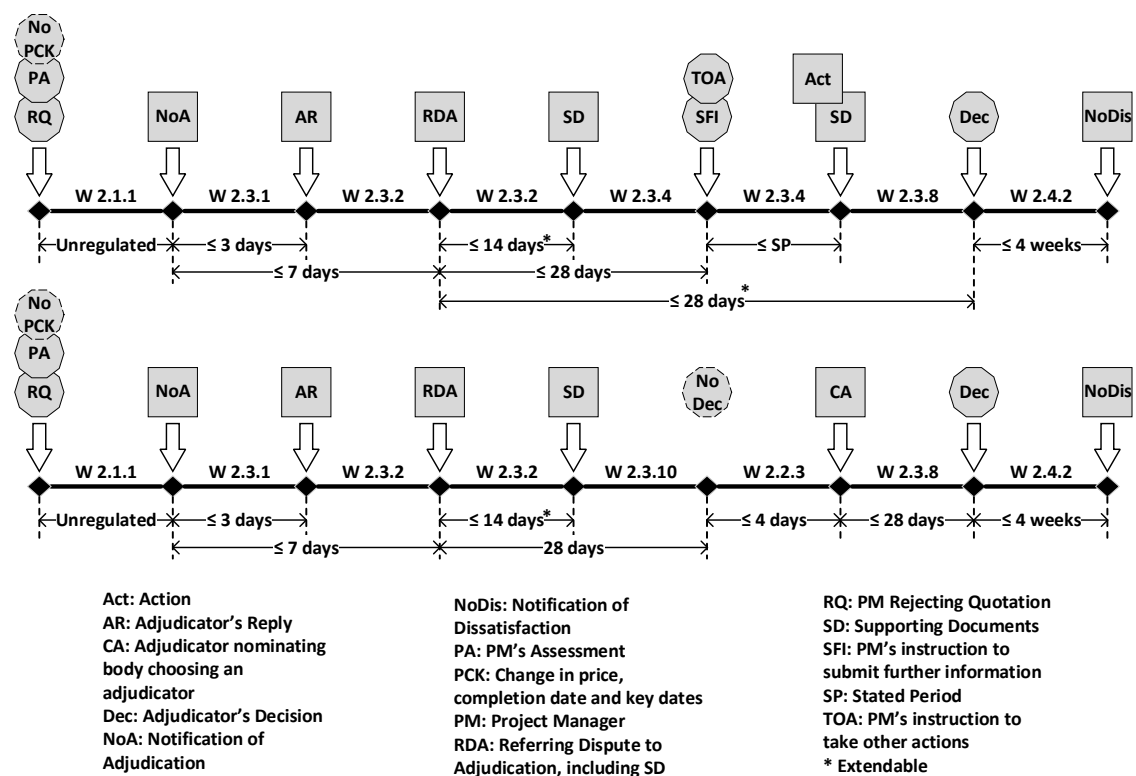


Figure 50. Dispute Resolution W2

If the requested party fails to comply with any instruction within the stated time, the adjudicator proceeds with the adjudication and renders a decision based on the information that has been already presented. Subject to sub-clause W2.3.8, the adjudicator shall render a decision within 28 days from the referral of the dispute. Under the same sub-clause, it is clarified that the aforementioned period can be extended by up to 14 days upon the agreement of the referring party or any other period upon the consent of the contracting parties. As in the case of option W1, the decision of the adjudicator is issued as binding with the possibility of becoming final if neither party submits a notice of dissatisfaction. Such a notice should be issued within four weeks of the rendering of the adjudicator's decision.

On the other hand, if the adjudicator fails to render a decision within the stipulated period, the contracting parties and the adjudicator can agree to extend the period allocated to render a decision by the adjudicator. However, if agreement was not reached, the contracting parties can act as if the adjudicator has resigned. As such, a new adjudicator shall be jointly appointed by the contracting parties or chosen by the adjudicator nominating body. The chosen adjudicator must be able to decide on the referred dispute within four weeks from being chosen.

4. Claim Evolution Process Flowchart

In order to assist the contract administrators and practitioners working on projects governed by the NEC standard conditions, a guide flowchart showing the claim

evolution process was constructed. The presented flowcharts in Figures 51 and 52 summarize all the scenarios that could occur under the two sections of the claim/dispute resolution mechanism: the compensation event and the dispute resolution procedures respectively.

Upon the occurrence of a compensation-related event, a claim is initiated at the “Notification of compensation event” stage. Subsequently, the submission of said notification within 8 weeks triggers the “PM Decision” stage. Otherwise, the process terminates. Following the “PM Decision” stage, the matter can escalate to a dispute and move to the second section of the mechanism, dispute resolution, if the project manager rejects the event and decides to reject any changes in price, completion date, or key dates. On the other hand, the matter stays within the first part of the mechanism and moves to the quotation stage in the case where the project manager either accepts the event or fails to decide on the submitted claim within a period of two weeks. In both cases, the contractor is instructed to submit a quotation in 3 weeks. Depending on whether the quotation was submitted within the time allocated or not, the claim either moves to the “PM Reply” stage or to the “PM Assessment” stage, respectively. If the claim reaches the “PM Reply” stage, the project manager has to reply to the submitted quotations within two weeks. Failing to do provides the project manager another period of two weeks, triggered once the contractor submits the notification of failure.

The project manager’s reply can be (1) a rejection of the quotation, in which case the matter escalates to = dispute resolution =, (2) an acceptance of the quotation,

thus ending the compensation event process by resolving the matter, (3) an instruction to the contractor to submit a revised quotation, hence returning the matter back to the “Quotation” stage, or (4) a decision that he will do his own assessment, thereby proceeding the issue to the “PM Assessment” stage. If the compensation event reaches the “PM Assessment” stage, the project manager must submit his assessment within a period of three weeks; otherwise, the contractor can issue a notification of failure, thus offering the project manager an additional period of two weeks to make his assessment. Once the assessment is submitted, the contractor decides whether to end the process or to proceed with the dispute resolution procedure.

For cases where the project manager fails to act within the additional offered period, which is triggered by submitting a notification of failure by the contractor, the submitted quotation of the contractor is treated as accepted. However, the employer can object to the acceptance of such quotations by invoking the dispute resolution procedure.

Prior to initiating a dispute resolution procedure, the applicability of the United Kingdom Housing Grants, Construction and Regeneration Act 1996 must be assessed. In case it was found that the Act does not apply, option W1 is adopted. To trigger the underlying procedure, the referring party has to issue a notice of dissatisfaction within two weeks of the occurring event and to refer the matter to adjudication within a period of four weeks. Any further relevant information must be submitted for the consideration of the adjudicator within a period of 4 weeks.

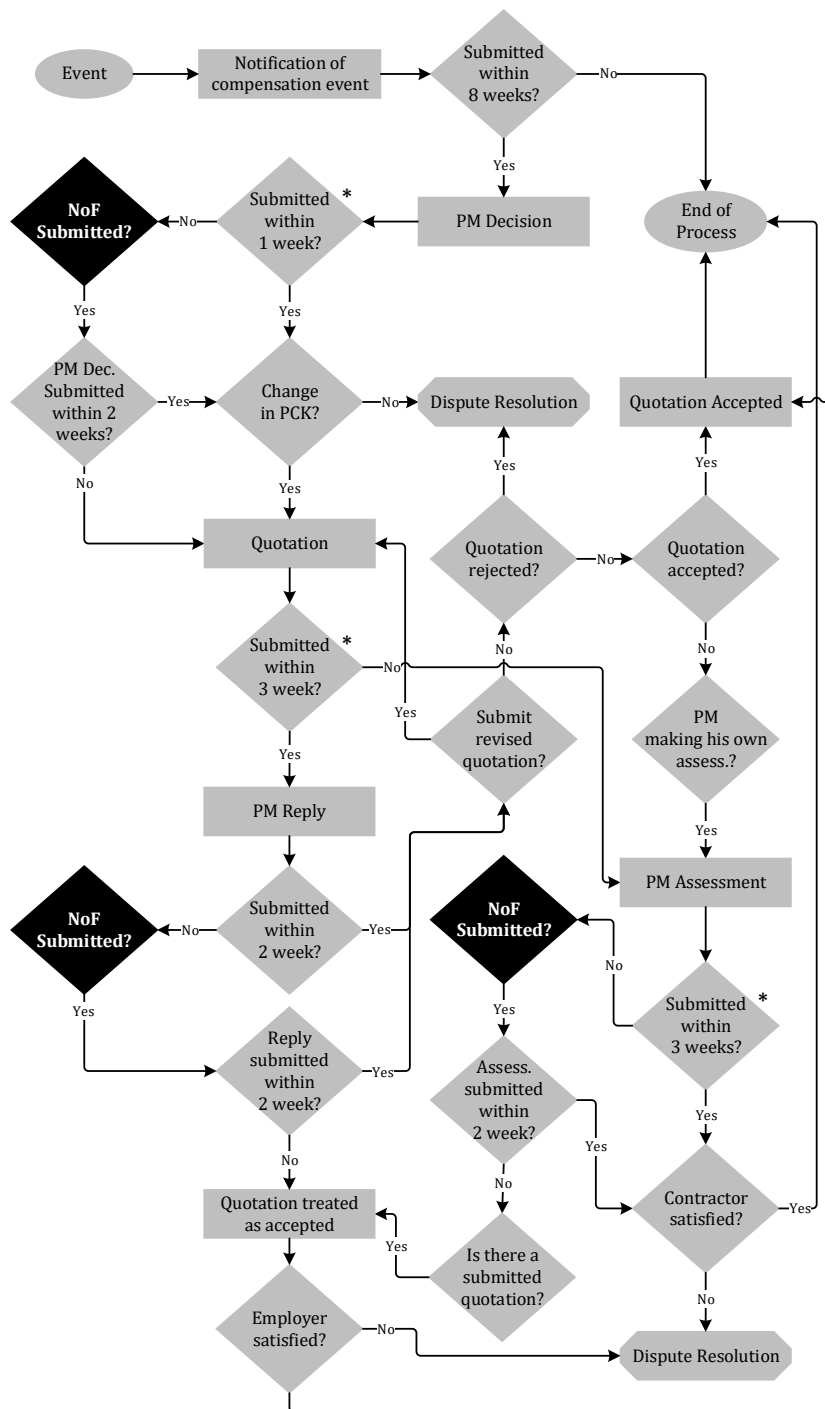


Figure 51. Claim Evolution Flowchart: Compensation Event

Similarly, a party shall respond to the adjudicator's instruction within the stated period. Otherwise, the adjudicator may not consider the furnished information and decides on the referred dispute based on the available information provided. Once an adjudicator has rendered a decision or once the duration for rendering a decision expires, a dissatisfied party can issue a notice of dissatisfaction, within four weeks, to refer the dispute to the tribunal.

On the other hand, the dispute procedure under option W2 is similar to that under option W1 with minor differences in the starting and closing mechanisms. Prior to referring the dispute to adjudication, the adjudicator has to inform the contracting parties that he/she is able to perform an adjudicatory role regarding the submitted claim. Otherwise, the adjudicator resigns and a new one must be chosen. Similarly, if the adjudicator fails to render a decision within the stipulated period, the contracting parties can either extend the allocated period by mutual agreement or consider that the adjudicator has resigned and appoint a new one. Finally, it must be noted that notifications of failure in Figure 51 and the notification of adjudication in Figure 52 were highlighted in black to indicate that these stages are unregulated periods, where the contractor can take action at any time.

5. Discussion

A thorough analysis of the developed array of possibilities that are likely to occur during the progression of claims revealed a number of findings pertaining to: (1) the

role of the project manager as compared to that of the architect/contract administrator and of the engineer under the JCT and FIDIC construction respectively, (2) the indirect function of the notification of failure, (3) the impact of adopting option W1 for adjudication versus W2, and (4) the absence of rooms to adopt any of the alternative dispute resolution techniques.

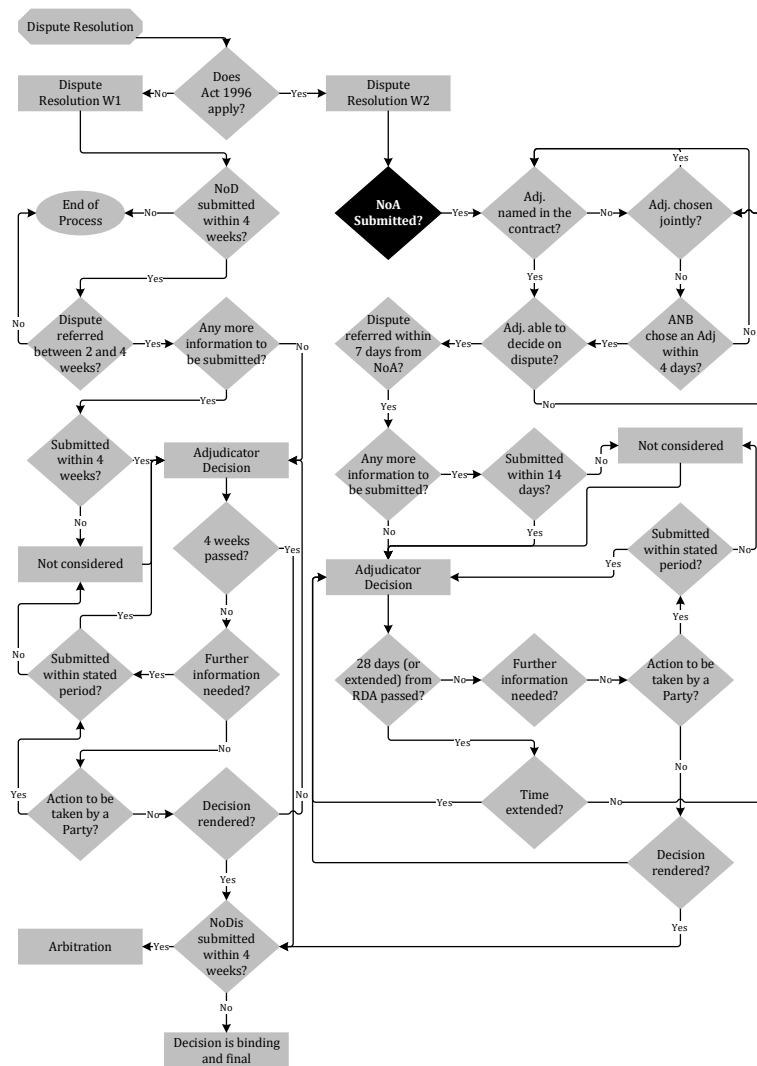


Figure 52. Claim Evolution Flowchart: Dispute Resolution

a. Project Manager

The role exercised by the project manager is arguably compared to that of the architect/contract administrator and the engineer under the JCT (2016) and FIDIC (2017) standard conditions for the construction contract, respectively. Engineering professionals acting under these roles are third parties appointed by the employer to administer the contract on their behalves and carry out duties and responsibilities that are stipulated in the corresponding contracts. When limiting the comparison scope to the claim/dispute resolution mechanism, it is found that these roles are responsible for rendering the initial judgment regarding the submitted claim. However, the properties of the corresponding judgments and the periods within which such judgments shall be made differ. Under FIDIC conditions, the engineer shall render a determination that is effectively binding with the possibility of becoming final if no contracting party issued a notice of dissatisfaction in that regard. At the determination stage, decision shall be rendered within a period of 7 weeks from failure to reach agreement through consultations. On the other hand, the architect/contract administrator, under JCT conditions, is responsible for rendering decisions with respect to claims submitted for adjusting the completion date, or to decide on ascertained amounts regarding claims submitted for recovering losses and expenses. The JCT contract conditions specify periods of 12 weeks and 2 weeks, respectively, to render such judgments. The corresponding time-bars are triggered upon the submission of a full claim, including particulars. However, these conditions do not stipulate the property of the rendered

judgment. Similarly, the NEC conditions do not specify the property of the replies issued by the project manager with respect to the submitted claim. However, option W1 specifies that the referral of dispute to adjudication shall take place within a stipulated period and the failure of such action waives the right of both parties to pursue adjudication or arbitration. Therefore, it can be inferred that the project manager's reply could possibly turn binding and final if dispute was not referred to adjudication. Furthermore, the conditions stipulate that the project manager shall carry out this duty within a period of 2 weeks from the receipt of the quotations.

Another comparable attribute, in regard to the studied roles, is the intermediate judgment offered prior to the initial one. The project manager shall render a decision regarding the submitted notice of claim to decide whether a change in contract prices, completion date, or key dates is to be offered. If expense or time compensations have been decided on, the project manager instructs the claimant to submit a quotation. Similarly, the engineer must provide a reply addressing the principles of the claim, even if the engineer opts to ask for further particulars prior to rendering a determination. Said reply shall judge the eligibility of the claim through an assessment of the contractual and/or other legal basis of the claim. On the other hand, the architect/contract administrator has no similar duty stipulated under the JCT conditions.

Despite the numerous similarities, several differences are observable when it comes to some of the other unique duties performed and the consequences of the failure to render judgments within the stipulated time period. Firstly, the project manager shall

do his/her own assessment if the contractor fails to submit the quotation. However, the engineer, under the FIDIC conditions, is not required to do the homework of the contractor. In fact, the engineer's duty is limited to assessing the submitted dossier by the claimant and requesting further information if the ones made available were insufficient to give a determination. Yet, the engineer must conduct consultations with both parties in an attempt to reach agreement prior to finalizing and communicating determinations. On the other hand, the architect/contract administrator is only responsible for assessing claims and rendering judgments. Secondly, if the project manager fails to reply to a submitted quotation within the stipulated period, the claimant has the option to issue a notification of failure to trigger a 2 week-period, that offer the project manager a second chance to issue a reply. Afterwards, if the project manager fails to issue a reply, the submitted quotation is deemed accepted. On the contrary, the failure of the engineer, under the FIDIC conditions, to render a determination within the stipulated time is in and of itself a determination rejecting the claim. On the other hand, the consequences of the failure of the architect/contract administrator to render a judgment is not stipulated under the JCT conditions.

b. Notification of Failure

There are two durations in claims/disputes timelines whereby the claimant can issue a notification of failure. These durations become available upon the failure of the project manager to render a decision regarding the submitted notification of claim and/or to

reply to the furnished quotation. The advantage of the notification of failure is to enforce the project manager to act within a stipulated period because the failure of the Project Manager to do so is considered an acceptance of the requested change in contract price, completion date, and/or key date. Although the contract conditions offer this possibility, it does not stipulate a regulated time-bar for the issuance of the notification of failure. In fact, the contractor can issue this notification at any time after the expiry of the time-bar of the project manager's action. Hence, these two durations are arguably unregulated periods that would possibly allow the prolongation of the claim resolution process.

c. Adjudication: Option W1 versus Option W2

Although adopting option W1 or option W2 is dependent on whether the United Kingdom Housing Grants, Construction and Regeneration Act 1996 applies or not, contracting parties need to know the differences between these options so that they would be able to modify the adopted one, if needed. Overall, both options adopt similar procedures that differ in the initiation and the failure of adjudicator to render a decision. Under option W1, the referring party shall issue a notice of dissatisfaction and refer the matter in dispute to adjudication within stipulated periods and the failure to do so deprives both parties from pursuing adjudication and arbitration. On the contrary, to initiate the adjudication mechanism under option W2, the referring party can issue a notification of adjudication at any time. As such, there exists an unregulated period that

could allow the claim's progression to drag on for an undesirably long period. Moving to the ending mechanism, either party shall issue a notice of dissatisfaction to trigger the initiation of arbitration, irrespective of the provision of a rendered decision by the adjudicator or lack thereof, where the notice of dissatisfaction is a condition precedent to arbitration. To this end, a concerning scenario exists if the adjudicator fails to render a decision and neither party issued a notice of dissatisfaction. Consequently, the contracting parties will not be able to proceed to arbitration, and there is no final and binding judgment applicable for the resolution of the matter in dispute.

This concern does not exist under option W2 given the fact that the inaction of the adjudicator is deemed as a resignation, thereby giving the right to the parties to appoint another adjudicator that should be willing to act and render a decision regarding the matter in dispute. Thus, the adjudication process under this option will always end up with a decision rendered by an adjudicator. Consequently, either party could proceed to arbitration if that party was dissatisfied with the adjudicator's decision.

d. Rooms for Alternative Dispute Resolution Techniques

When examining the timeline of the claim/dispute resolution mechanism, it was found that there are no rooms through which parties could seek the resolution of claims using alternative dispute resolution techniques, such as mediation, conciliation, facilitation or any other technique. As a matter of fact, parties are enforced to go to arbitration if they were dissatisfied with project manager's reply or the adjudicator's decision. To this end,

it can be argued that parties might find themselves obliged to accept these judgments to avoid referring matters to arbitration.

G. JCT Claim/Dispute Resolution Mechanism

Another widely adopted set of standard conditions for the construction contract is the one offered by Joint Contract Tribunal (JCT). When conflicts arise during the course of a construction project, the contracting parties shall refer to the underlying claim/dispute mechanism to administer the corresponding resolution process. As such, the aim of this section is to meticulously examine the underlying claim/dispute resolution mechanism to formulate the corresponding claim/dispute timeline. The adopted methodology included: (1) a review of JCT 2016's "Adjustment of Completion Date", "Loss and Expense", and "Section 9 Settlement of Disputes", (2) extraction of the overall mechanism, and (3) development of detailed timelines. Afterwards, a thorough analysis of the findings assessing different aspects of the studied mechanism is offered.

1. Underlying Claim/Dispute Mechanism

Under the JCT conditions, different mechanisms are adopted for different types of claims. In fact, claims for adjustment of the completion date shall be initiated pursuant to sub-clause 2.27 "Notice by Contractor of delay to progress", while that for losses and expenses shall be initiated pursuant to sub-clause 4.21 "Notification and Ascertainment". In either case, whenever a claim escalates to a level of dispute, it shall

be resolved pursuant to “Section 9 Settlement of Disputes”. This overall mechanism is illustrated in Figure 53.

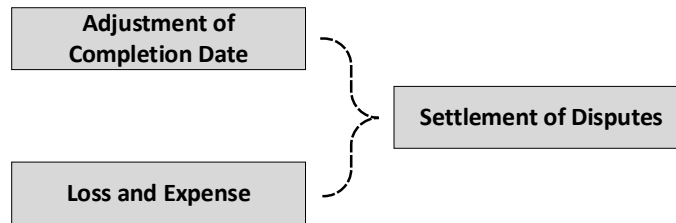


Figure 53. Overall Claim/Dispute Mechanism

2. Detailed Timelines

Throughout this section, each part of the overall mechanism is studied to develop the detailed timelines.

a. Adjustment of Completion Date

Under sub-clause 2.29 “Relevant Events”, there is a specified list of all events that could trigger the timeline of claims for the adjustment of the completion date, as illustrated in Figure 54. In fact, the contractor shall issue a notice of claim to the architect/contract administrator, a party appointed by the employer and named in the contract, whenever it becomes reasonably apparent that the progress of the works is being or is likely to be delayed. The notice of claim shall be submitted pursuant to sub-clause 2.27 “Notice by Contractor of delay to progress” and shall include the causes of the delay and the relevant event that triggered the underlying mechanism.

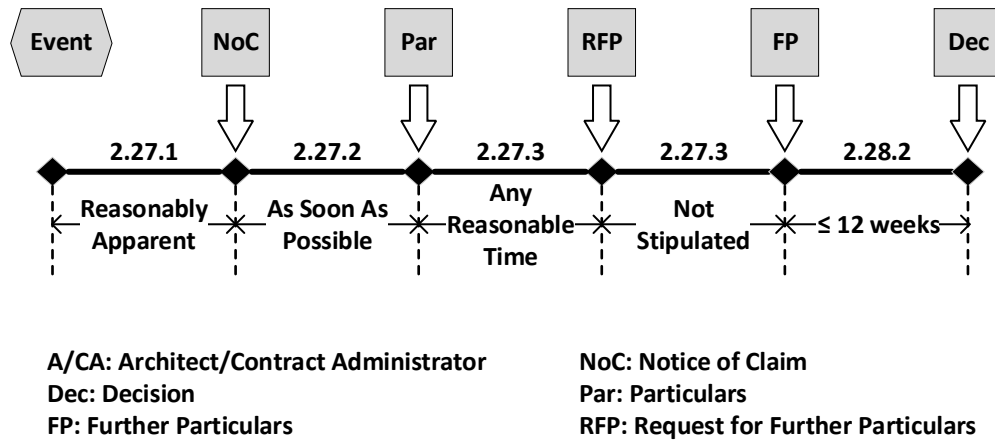


Figure 54. Timeline of Claims for the Adjustment of Completion Date

In addition, the contractor shall furnish a description of the expected resulting impacts either concurrently while issuing the notice of claim or as soon as possible after the submission of the notice of claim. Particulars shall include an estimate of the delay in the schedule that is beyond the relevant completion date. If the estimated delay or particulars changed, the contractor shall forthwith inform the architect/contract administrator accordingly. On the other hand, the architect/contract administrator may, at any reasonable time, require further information. However, the relevant sub-clause does not specify a time-bar for the contractor to act within. Once all the required particulars are made available, the architect/contract administrator shall proceed to render a decision within a period of 12 weeks from the date the required particulars were submitted. If there is less than 12 weeks for the completion date, the

architect/contract administrator shall endeavor to render a decision prior to the completion date. The pertinent sub-clauses do not stipulate the property of the rendered decision as being binding or binding with the possibility of becoming final.

b. Loss and Expense

When a conflict arises due to a loss and/or an expense, the contractor shall refer to the underlying mechanism stipulated under sub-article 4.21 “Notification and ascertainment” to resolve it. Similar to the claims of adjustment of completion date, the event triggering the timeline of loss and expense claim, illustrated in Figure 55, shall be listed as one of the events specified under sub-clause 4.22 “Relevant Matters”.

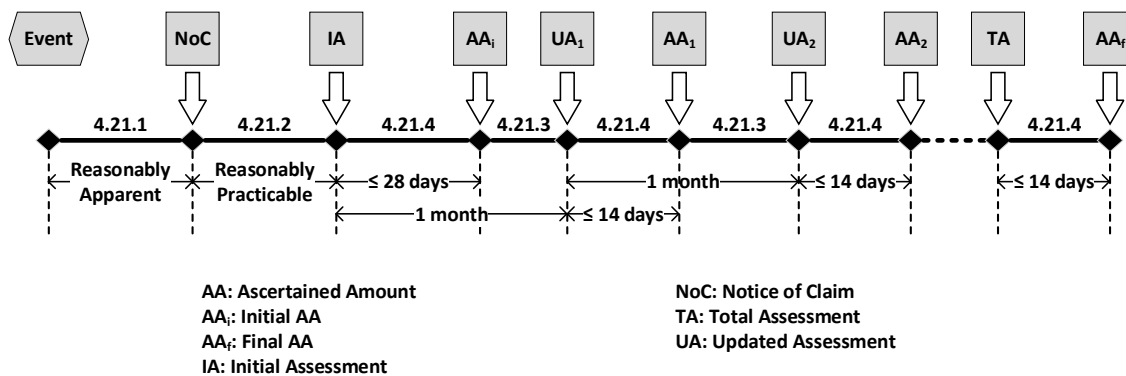


Figure 55. Timeline of Claims for Loss and Expense

Moreover, the disclosure of claim under this mechanism is similar to that under the adjustment of completion date, where the contractor shall issue a notice of claim to

the architect/contract administrator as soon as the extent of any loss and/or expense becomes or should have become reasonably apparent to the contractor. The initial assessment of the incurred loss and/or expense shall be submitted either when submitting the notice of claim or as soon as reasonably practicable. Afterwards, the contractor shall update the assessment based on monthly intervals until submitting the final assessment. The duty of the architect/contract administrator under this timeline is to ascertain the loss and/or expense occurred. In this regard, a quantity surveyor can carry out this duty as specified under sub-clause 4.21.4. Said ascertainment shall be made within 28 days from the date the initial assessment was submitted and within 14 days from the date the updated assessment was submitted. The ascertainment shall be fully detailed so that the contractor would be able to identify the differences between the assessment and the ascertainment. Although the property of the ascertainment is not stipulated, sub-clause 4.23“Amounts ascertained – addition to Contract Sum” specifies that the amount ascertained shall be added automatically to the contract sum.

c. Settlement of Disputes

Unsettled claims, due to either party’s dissatisfaction with the architect/contract administrator’s judgments or the inaction of the latter, shall be resolved pursuant to “Section 9 Settlement of Disputes”. The underlying mechanism is illustrated in Figure 56.

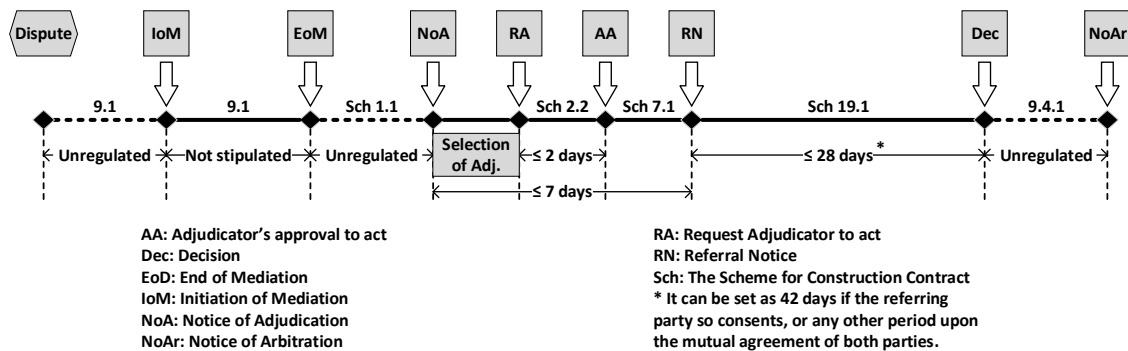


Figure 56. Timeline of Dispute Settlement

Prior to referring disputes to adjudication, contracting parties can mutually agree to initiate mediation in an endeavor to reach agreement. In fact, sub-clause 9.1 “Mediation” stresses this idea by stipulating that “each Party shall give serious consideration to any request by the other to refer the matter to mediation”. The mediation process can be convened at any time and does not act as a condition precedent to adjudication. As such, either party can directly refer the matter in dispute to adjudication pursuant to sub-clause 9.2 “Adjudication”. The adjudication mechanism adopted under this sub-clause is the one stipulated under “Part I-Adjudication” of “The Scheme for Construction Contract” (1998). Whenever any party opts to refer a dispute to adjudication, the referring party shall issue a notice of adjudication to the other party of the contract. Afterwards, the adjudicator shall be selected following the process presented in Figure 57.

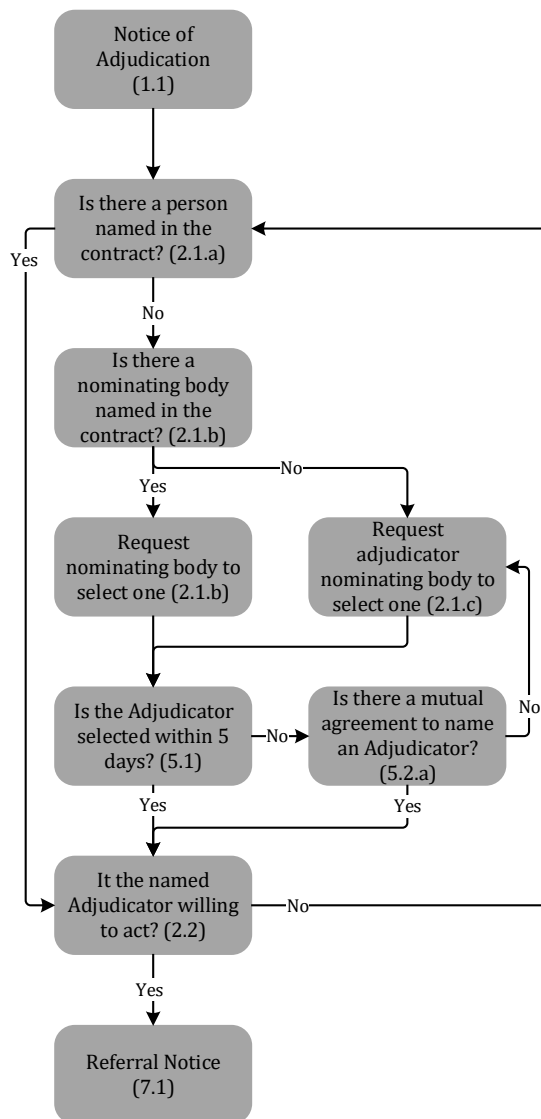


Figure 57. Selection of Adjudicator

First, the referring party needs to check if any person is named in the contract to act as an adjudicator. If this was not the case, the referring party shall request the nominating body to select an adjudicator. If a nominating body was not named in the

contract, the referring party shall request any adjudicator nominating body to select a person to act as an adjudicator. To this end, it has to be clarified that the nominating body is unlike the adjudicator nominating body in that the latter is a third party known publicly as a body which selects persons to act as adjudicators when requested to. In either case, paragraph 5.1 of the “Scheme” stipulates that the adjudicator shall be selected within 5 days. If the requested body failed to do so within the specified period, paragraph 5.2.a stipulates that both parties can mutually select a person to act as an adjudicator. Whenever the parties fail to mutually agree on this matter, the referring party shall request another adjudicator nominating body to select an adjudicator within a period of 5 days. This cycle, theoretically, repeats until a person is selected to act as an adjudicator.

Once a person is requested to act as an adjudicator, that person shall indicate, within two days of receiving the request, whether or not he/she is willing to act. If the adjudicator’s is willing to act, then the referring party shall refer the dispute to the adjudicator. On the other hand, if the selected person is unwilling to act as an adjudicator or failed to reply within the stipulated period, the selection process starts all over again. As such, the referring party shall check if there is another person named in the contract to act as an adjudicator. If not, the discussed procedure shall reiterate. The person acting as an adjudicator shall be independent and shall not be an employee of either parties involved in the dispute. Most importantly, the adjudicator shall act impartially when carrying out his/her duties.

The referring party shall issue a notice of referral to refer the dispute to the selected adjudicator, who is willing to act on this matter. The referral notice shall be made within 7 days from the date the notice of adjudication was issued and shall be accompanied by a copy of the construction contract and any other document the adjudicator might need to render the decision. The adjudicator shall render the decision within 28 days from the date of the receipt of the notice of referral, which can be extended to 42 days upon the consent of the referring party. In fact, the adjudication period can be extended to any other duration upon the agreement of both contracting parties. If the adjudicator resigns or fails to render a decision within the specified period, the referring party needs to issue another notice of adjudication to re-trigger the corresponding process and another adjudicator shall be selected to render a decision regarding the matter in dispute. Paragraph 23 specifies that the adjudicator's decision is binding with no possibility of becoming final. Henceforth, the contracting parties shall comply with the decision until it is finalized by arbitration or by agreement of both parties. If agreement regarding the rendered decision was not reached, either party can refer the matter to arbitration any time from the issuance of a notice of arbitration to the other party.

3. Discussion

The conducted detailed analysis offered a set of findings pertaining to (1) time-bars of disclosure of claim phases, (2) time allocated for the architect/contract administrator to

decide on claims for adjustment of completion date in comparison to those of losses and expenses, (3) the unstipulated procedure of mediation, and (4) the unique property of adjudication's decision.

a. Disclosure of Claim Time-Bars

The Disclosure of Claim phase consists of two stages, notice of claim and particulars. Under both types of claims, completion date claims and loss/expense claims, the JCT contract conditions do not stipulate specified time-frames for those stages. Consequently, this could lead to claims being prolonged to undesirably long periods of time. As a matter of fact, this contradicts the property of similar stages under other standard sets of contract conditions, namely those published by AIA, ConsensusDocs, EJCDC, FIDIC, and NEC. All the aforementioned standard forms specify explicit time-bars for the corresponding stages. Therefore, it is recommended for parties adopting this set of contract conditions to adjust the relevant clauses to regulate the claims/dispute mechanism.

b. Adjustment of Completion Date versus Loss and Expense

What is unique about the JCT contract conditions is that they adopt different mechanisms for different types of claims. Theoretically, these mechanisms shall allocate similar time-bars for similar stages. However, the underlying mechanisms for adjustment of completion date offers the architect/contract administration a period of 12

weeks (84 days) to render decisions while that of loss and expenses offer the same party a period of 4 weeks (28 days) to reply to a submitted claim. To this end, the great difference presented in the corresponding time-bars is interesting, yet concerning, given that all other standard conditions adopt the same mechanism for both types of claims/disputes.

c. Mediation

Although the contract conditions stipulate that parties can refer matters in dispute to mediation, they do not stipulate the properties of this procedure. In fact, it was inferred that this procedure is optional and, hence, can be initiated upon mutual agreement of both parties. However, the duration of the mediation process and the ending mechanism were not stipulated. Therefore, it is recommended for parties adopting this set of contract conditions to clarify such details in an attempt to mitigate any ambiguity and better administer any claims and disputes.

d. Adjudication's Decision

Adjudication by a sole adjudicator or a dispute adjudication board produces an outcome decision that is binding with the possibility of becoming given that neither party had issued a notice of dissatisfaction to trigger arbitration. As a matter of fact, this is the case set forth by the adjudication processes under FIDIC (2017) and NEC (2013) construction contract conditions. However, the adjudicator's decision, under the JCT

conditions, is binding with no possibility of becoming final. Consequently, the underlying adjudication process cannot be considered as an alternative dispute resolution technique because it is unable to resolve disputes completely, as disputes shall eventually be settled either through agreement or arbitration.

CHAPTER VI

COMPARATIVE ANALYSIS OF STANDARDIZED MECHANISMS

A. Preamble

The construction contract conditions play a critical role as to the administration and resolution of claims and disputes. In practice, relevant such conditions, including those of the widely adopted standard conditions by the AIA, EJCDC, ConsensusDocs, FIDIC, JCT, and NEC, are found to be offering a variety of multistep mechanisms that can be prompted for that purpose. The objective of this chapter is to perform a comparative analysis of the various claim/dispute administration and resolution steps stipulated under these standard conditions. The analysis is specifically concerned with the investigation of (a) the steps stipulated under each set, (b) the sequence with which these steps can be triggered, and (c) the resulting spectrum of the steps' operational variations that exist across all the examined mechanisms. Besides, this chapter examines the roles engineering professionals are required to exercise under the mentioned sets of standard conditions. In fact, claims and disputes contract clauses are meant to specify and regulate the mechanisms adopted for tracking, expediting, and resolving claims and disputes that arise under construction contracts. As such they inexorably lead to engaging all main project participants in an inevitably demanding process, and over a

rather long period of time. Inherent to such processes is therefore the engagement of an array of engineering professionals, in respect of rendering judgements such as opinions, findings, determinations, dispute review recommendations, adjudication decisions, pre-arbitral decisions, or arbitral rulings.

B. The All-Encompassing Timeline

Contract conditions typically stipulate that either the owner or the contractor may submit a claim with respect to an arisen conflict and shall for that purpose follow the mechanism set forth in the relevant provisions, in order to attempt and ultimately reach a resolution thereto. However, different sets of standard conditions adopt different mechanisms that vary in many aspects, including, but not limited to: the prescribed phases and their order of occurrence, the involved parties and the capacities under which they act, and the types of rendered judgments. Henceforth, the work presented in this paper aims at fully studying the spectrum of claim/dispute resolution mechanisms stipulated under the AIA, ConsensusDocs, EJCDC, FIDIC, JCT, and NEC standard construction contract conditions. The performed comparative analyses specifically investigate (1) the steps stipulated under each set; (2) the sequence with which the steps are successive triggered, and (3) the resulting gamut of the operational variations for each of the prescribed steps. As such, the adopted methodology involved (1) the examination of the relevant claims/disputes provisions under each set of standard conditions, (2) the development of the corresponding claims/disputes tracking timelines

that can depict the progression of claims/disputes, (3) the extraction of the detailed properties of each stage within the discussed timelines, and (4) the creation of the properties' matrices that illustrate the operational variations for each stage. The ultimate goal lies in being able to deduce an all-encompassing mechanism that can reveal the full continuum of the multiple steps, and their sequence, which can possibly be entertained for adoption by project owners. As such, the offered findings are crucial to project participants assisting owners in custom-tailoring the preferred claims/disputes administration and resolution mechanisms and, as well, to contracting organizations involved in construction contract negotiations.

1. Standardized Claims/Disputes Timelines

While conflicts arising during the course of construction shall be resolved pursuant to the underlying claim/dispute mechanism, existing standard forms of contract conditions are found to be adopt different resolution mechanisms. As such, this section examines the relevant conditions offered by six standard conditions sets to explore the variations existing along their corresponding claim/dispute resolution timelines.

a. AIA Claims/Disputes Timeline

The underlying claims/dispute mechanism, as illustrated in Figure 58, is stipulated under “Article 15 Claims and Disputes” of the AIA standard conditions. When an eligible/relevant event occurs, the claimant shall issue a notice of claim to the other

party and to the initial decision maker, a third party named in the contract, within a period of 21 days from the day of occurrence of the event giving rise to the claim. The notice of claim needs not to contain all the information pertinent to the submitted claim (AIA Document Commentary 2007). Subsequently, the initial decision maker is offered a period of 10 days to take actions, stated to include: (1) request supporting data from the claimant; (2) request a response with supporting data from the other party; (3) approve the claim in whole; (4) reject the claim in whole; (5) reject the claim in part; (6) suggest a compromise; (7) advise that it is inappropriate for the initial decision maker to resolve the claim; and/or (8) advise that the initial decision maker is unable to resolve the claim because of a lack of sufficient information. If the initial decision maker requests either party to submit supporting data, that party shall within a period of 10 days: (1) furnish the requested supporting data; (2) advise the initial decision maker that no supporting data will be furnished; or (3) advise the engineer that more time is needed to furnish the supporting data. Afterwards, the initial decision maker shall render an initial decision within a period of 30 days from the date of receipt of the notice of claim. The initial decision shall contain (1) an approval of the claim in whole, (2) a rejection of the claim in whole, (3) a partial rejection of the claim, or (4) a declaration to the contracting parties that the initial decision maker is unable to resolve the claim. The initial decision is a condition precedent to mediation, unless it was not rendered within the stipulated period. Upon the rendering of the initial decision or the expiry of the corresponding period, either party can unilaterally file for mediation, and at any time.

However, if an initial decision was rendered, either party can demand the other party, within 30 days after the decision was rendered, to file for mediation within a period of 30 days. If the demanded party fails to do so, both contracting parties waive their rights to later pursue mediation or binding dispute resolution. Once mediation is initiated, it shall last for a minimum period of 60 days, unless it was ended by reaching an agreement or concluded by the mediator, if deemed unsuccessful. Upon the expiry of this 60 day-period, either party can terminate the mediation process by issuing a demand for the other party to file for binding dispute resolution. Moreover, such demand can be issued within a period of 30 days from the date the mediation process was concluded. In either case, the failure of the demanded party to file for binding dispute resolution, within a period of 60 days, waives the right of both parties to pursue binding dispute resolution. On the other hand, failure to demand the other party to file for binding dispute resolution triggers an unregulated period where either party can file for binding dispute resolution at any time within the statute of limitations.

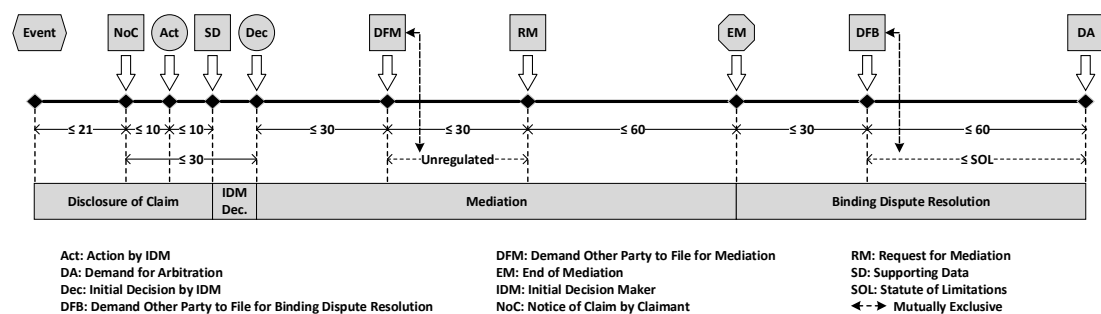


Figure 58. AIA Claim/Dispute Resolution Timeline

b. ConsensusDocs Claims/Disputes Timeline

Conflicts arising in construction contracts that adopt the ConsensusDocs conditions shall be resolved pursuant to “§ 8.4 Changes Notice” and to “Article 12 Dispute Mitigation and Resolution”. The corresponding timeline is extracted and presented in Figure 59.

To initiate a claim, the contractor shall issue a notice within 14 days after the occurrence of the event or after recognizing the conditions giving rise to the claim. Then, the contractor shall submit the supporting data within 21 days from the issuance of the said notice. Subsequent to that, the owner shall issue a response within 14 days after the receipt of the supporting data. Afterwards, the claim proceeds to an unregulated period, where both parties shall mutually agree to initiate direct discussions. Once discussions are initiated, that date shall be recorded as the date of the first discussions. Discussions shall last for a total period of 15 days and are undertaken at different organizational levels.

In fact, discussions start at the level of the parties’ representatives and then elevated to the level of the parties’ senior executives. If the parties fail to reach agreement through discussions, they shall refer the matter in dispute either to mitigation or mediation. If mitigation was chosen, the dispute proceeds to another unregulated period, where disputes can be referred to mitigation at any time. Once initiated, mitigation can last up to a maximum of 5 days through which the “neutral” or “dispute review board” shall issue a finding. On the other hand, the mediation process shall be

convened within 30 days and shall end within 45 days, where both time-bars are triggered from the date of the first discussions. If the dispute was not resolved through mitigation or mediation, either party shall file for binding dispute resolution within the statute of limitations.

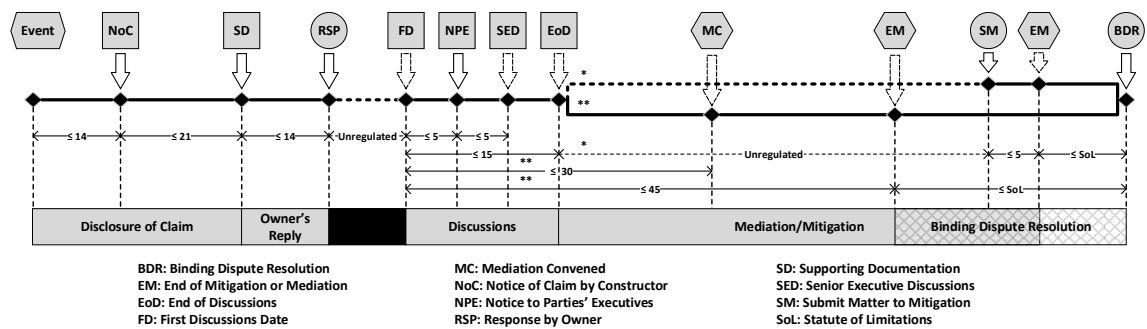


Figure 59. ConsensusDocs Claim/Dispute Resolution Timeline

c. EJCDC Claims/Disputes Timeline

When adopting the EJCDC conditions, the contracting parties follow the mechanism set forth in “Article 12 – CLAIMS” to resolve arising conflicts. The claim/dispute timeline, illustrated in Figure 60, is triggered upon the submittal of a claim, including supporting data, within 30 days from the occurrence of the event or the recognition of the circumstance giving rise to the claim. Consequently, the review and resolution stage are triggered, where the contracting parties shall endeavor to reach resolution through direct negotiation and exchange of information within a period of 90 days. During this stage,

the parties can mutually agree to initiate mediation, which shall stay the claim resolution and response process. If agreement was not reached through mediation, the claim resolution process resumes.

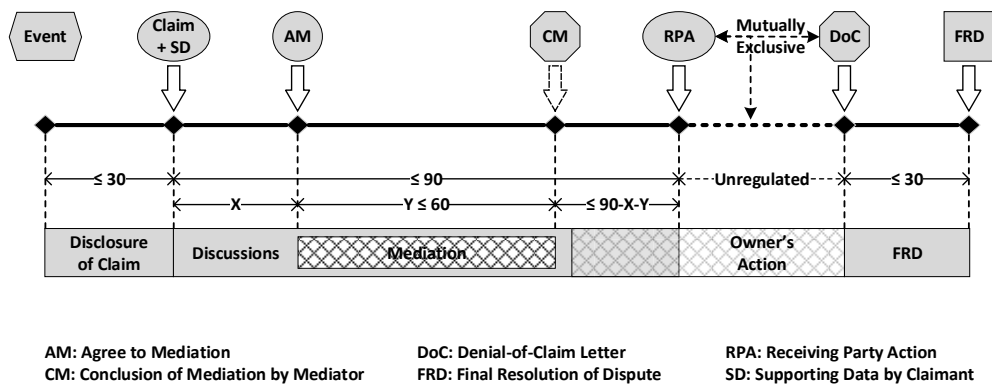


Figure 60 . EJCDC Claim/Dispute Resolution Timeline

At any time within the review and resolution period, the owner can render an action, indicating whether the claim is approved, rejected in whole, or rejected in part. The owner's action is a condition precedent to final resolution of a dispute that shall be filed for within a period of 30 days from the date on which the action was rendered. However, if the owner fails to render a judgment within the allocated period, either party can issue a denial-of-claim letter that deems the claim as rejected and triggers the time-bar for filing for a final resolution of the dispute in question.

d. FIDIC Claims/Disputes Timeline

Under the FIDIC standard conditions, the claims/disputes mechanism, illustrated in Figure 61, is stipulated under “Clause 20 Employer’s and Contractor’s Claims” and “Clause 21 Disputes and Arbitration”. To initiate a claim, the claimant shall submit a notice of claim within 28 days from when the claimant became or should have become aware of the event giving rise to the claim. Once the notice is submitted, the engineer, who is a third party named in the contract by the owner, can issue an initial response indicating whether or not the notice of claim was submitted within the relevant time-bar. If the engineer fails to issue such a response within 14 days, the notice of claim is deemed to be a valid notice. However, the other party can object to the inaction by the engineer through submitting a notice of disagreement indicating that the other party disagrees with such notice being deemed as valid.

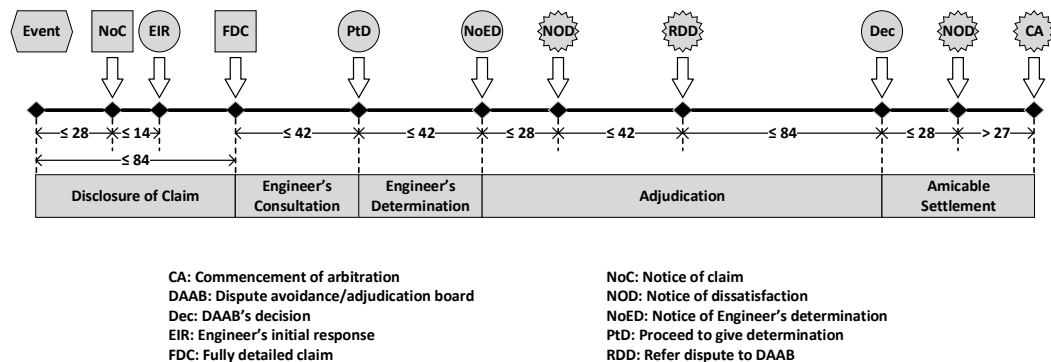


Figure 61. FIDIC Claim/Dispute Resolution Timeline

Regardless of both possible replies, as explained above, the claimant can proceed to submit a fully detailed claim. Afterwards, the engineer shall, within 42 days from the receipt of the fully detailed claim, consult both contracting parties jointly or individually in an endeavor to reach agreement. If agreement was not reached, the engineer shall proceed to give determination within another period of 42 days. Once the determination is rendered, any party objecting to it may issue a notice of dissatisfaction, within 28 days from the rendering of the determination. Otherwise, the determination of the engineer becomes final and binding on both parties. The dissatisfied party shall not only issue a notice of dissatisfaction but shall also refer the matter to adjudication within 42 days from the date of issuance of this notice. Otherwise, the determination of the engineer again becomes final and binding. Once adjudication is initiated, the dispute adjudication board is allocated a period of 84 days to render a decision. A party dissatisfied with the dispute adjudication board's decision shall issue a notice of dissatisfaction within 28 days from the date on which the decision was rendered or after the expiry of the adjudication's 84-day time bar in case no decision was rendered. As such, an amicable settlement period is triggered, in which parties may endeavor to resolve disputes amicably. Eventually, either party can commence arbitration on or after the 28th day of this amicable settlement period.

e. JCT Claims/Disputes Timeline

Under the JCT conditions, different mechanisms are adopted for different types of claims. In fact, claims for the adjustment of the completion date shall be initiated pursuant to sub-clause 2.27 “Notice by Contractor of delay to progress” while that for losses and expenses shall be initiated pursuant to sub-clause 4.21 “Notification and Ascertainment”, both presented in Figure 62. For the adjustment of completion date claims, the claimant shall issue a notice of claim whenever it becomes reasonably apparent that the progress of the works is being or is likely to be delayed. Afterwards, the claimant shall submit the particulars either along with the notice of claim or as soon as possible.

The architect/contract administrator, who is a third party named in the contract, shall render a decision regarding the submitted claim within 12 weeks from the receipt of the support information. On the other hand, the claimant shall issue a notice of claim for loss and/or expense as soon as the extent of any loss and/or expense becomes or should have become reasonably apparent to the claimant. Then, the claimant submits the initial assessment of the incurred loss and/or expense either along with the notice of claim or as soon as possible. Upon receipt of the claimant’s initial assessment, the architect/contract administrator or the quantity surveyor shall issue an ascertained assessment within 28 days.

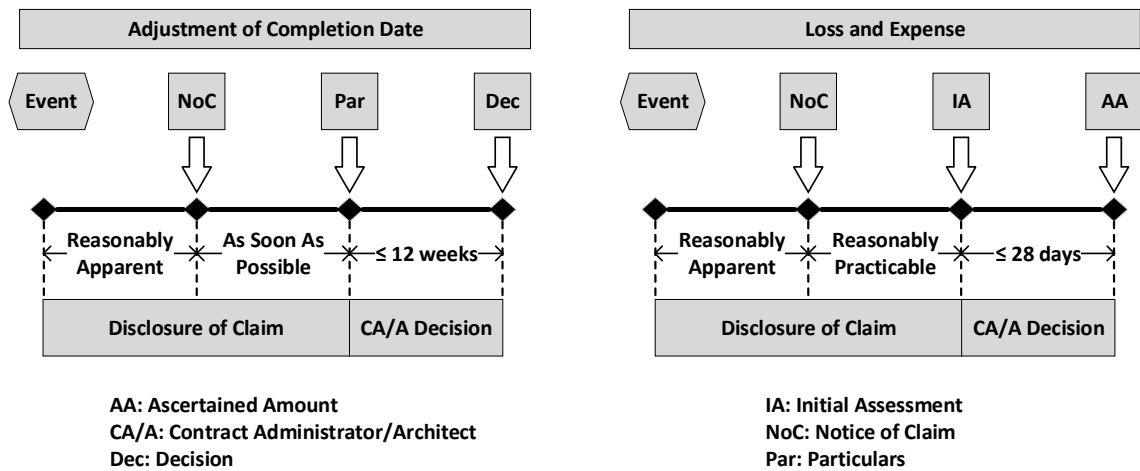


Figure 62. JCT Claims Resolution Timeline

If parties were not satisfied with the architect/contract administrator’s decision or ascertained amount, they can mutually agree to initiate mediation, as shown in the dispute resolution process that is presented in Figure 63. However, the JCT conditions do not stipulated anything about the operational mechanism of this phase. Consequently, it was inferred that mediation is not a condition precedent for adjudication. Therefore, even if mediation was not initiated, either party can refer the matter to adjudication at any time.

As such, the dissatisfied party shall issue a notice of adjudication, where the referring party shall request the adjudicator named in the contract to act. The latter shall reply within 2 days indicating whether or not he/she is willing to act. If the adjudicator confirmed his/her ability and willingness to act, the referring party shall issue a referral

notice within 7 days from the issuance of the notice of adjudication to refer the matter in dispute to the adjudicator. Afterwards, the adjudicator shall render a decision within 28 days from the referral of the dispute. If either party was dissatisfied with the adjudicator’s decision, that party can initiate arbitration at any time by issuing a notice of arbitration.

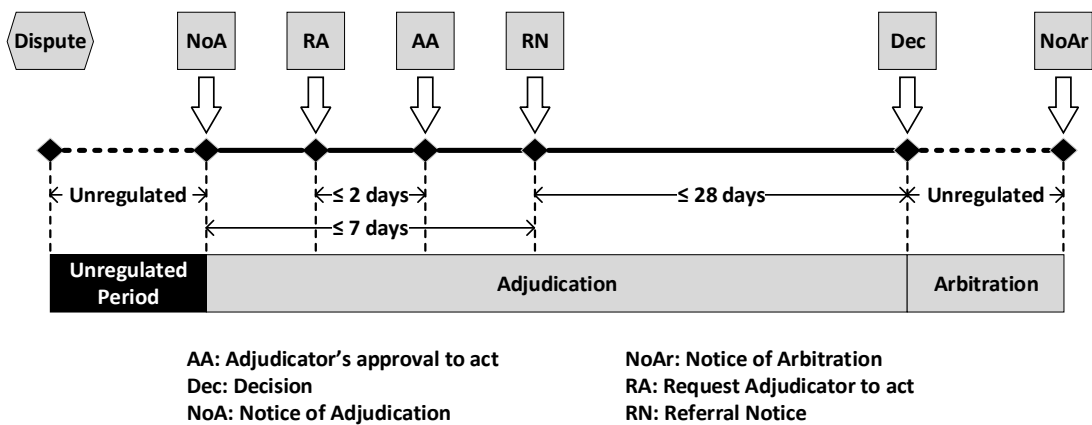


Figure 63. JCT Disputes Resolution Timeline

f. NEC Claims/Disputes Timeline

Conflicts arising during the course of a construction project that adopts the NEC standard conditions shall be resolved pursuant to Clause 6 “Compensation event”. To adopt the underlying mechanism, the arising conflict shall be one of the events listed under sub-clause 60 “Compensation events”, where the timeline, presented in Figure 64,

is triggered by issuing a notification of compensation event within 8 weeks from becoming aware of the event.

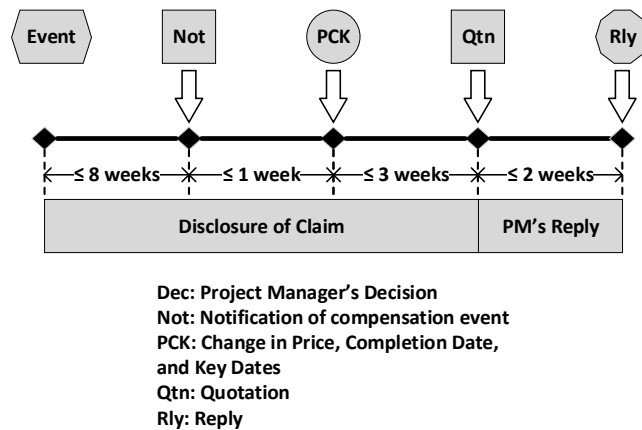


Figure 64. NEC Claim Resolution Timeline

Afterwards, the project manager, a third party named in the contract, is offered a period of 1 week to decide whether or not there would be a change in the price, completion date, and/or key dates. If the decision of the project manager confirms such a change, he/she shall instruct the claimant to submit a quotation within 3 weeks from the receipt of the project manager's decision. Upon receiving the quotation, the project manager shall reply within 2 weeks indicating whether the quotation is approved in whole, rejected in whole, or rejected in part.

The conflict could escalate to a dispute if the claimant was dissatisfied with the project manager's reply. In such cases, one of the mechanisms set forth either under "Option W1" or "Option W2", as illustrated in Figures 65 and 66 respectively, shall be

adopted to resolve arising disputes. “Option W1” is the default option that the parties must refer to unless the United Kingdom Housing Grants, Construction and Regeneration Act 1996 applies. In accordance with this option, the dissatisfied party shall issue a notification of dispute within 4 weeks from the issuance of the project manager’s reply.

Afterwards, that party shall refer the dispute to adjudication, between two to four weeks from filing the notification of dispute, accompanied by supporting documents. If either party wants to submit further particulars, that can be accommodated within 4 weeks from the referral of the dispute. When this period expires, a time-bar of 4 weeks is triggered during which the adjudicator shall issue a decision regarding the referred dispute. If either party was dissatisfied with the adjudicator’s decision, that party shall issue a notice of dissatisfaction within 4 weeks from the issuance of the decision to initiate arbitration

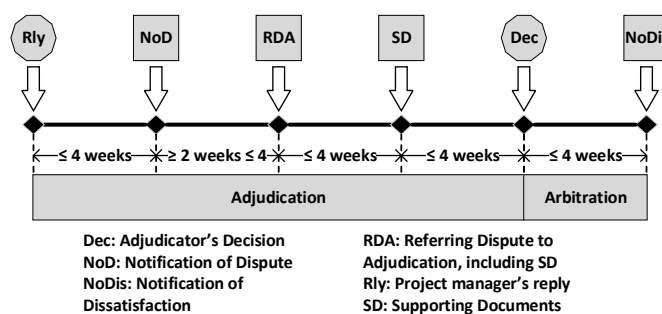


Figure 65. NEC Dispute Resolution Timeline (W1)

On the other hand, “Option W2” is adopted to resolve disputes when the United Kingdom Housing Grants, Construction and Regeneration Act 1996 applies. Under this option, Figure 66 presents an unregulated period prior to the initiation of the adjudication process to indicate that the dissatisfied party can trigger the underlying mechanism at any time by issuing a notification of adjudication. Within 3 days from the receipt of such a notice, the adjudicator named in the contract shall declare whether or not he/she is willing to act. Afterwards, the referring party shall refer the dispute to adjudication within 7 days from issuing the notification of dispute. In contrast with the case of “Option W1”, both parties are offered a period of only two (as opposed to four) weeks to submit further particulars. Subsequently, the adjudicator shall render a decision within 28 days from the date of receipt of the referred dispute. If either party was dissatisfied with the rendered decision, that party has a period of 4 weeks to issue a notification of dispute to trigger arbitration.

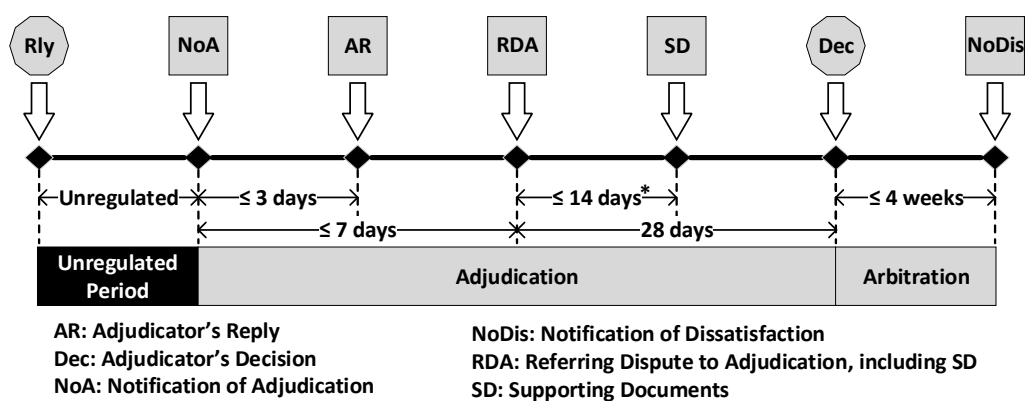


Figure 66. NEC Dispute Resolution Timeline (W2)

2. Deduced Spectrum of Progression Steps

As deduced from the previous analyses, the widely used sets of standard contract conditions are found to be offering a spectrum of claims/dispute resolution mechanisms. These major deductions, which are primarily concerned with the called-for steps/gates and the order with which they happen to be prescribed under each model, are as illustrated in Figure 67. It is evident that all mechanisms are triggered through the disclosure of a claim and, eventually, end when the resulting dispute is referred to arbitration. In between, these mechanisms consist of several phases that do not only differ in their function but also in their sequence/order. However, these phases can be categorized into 4 general groups, namely: (1) initial judgment, (2) discussions, (3) ADR, and (4) amicable settlement.

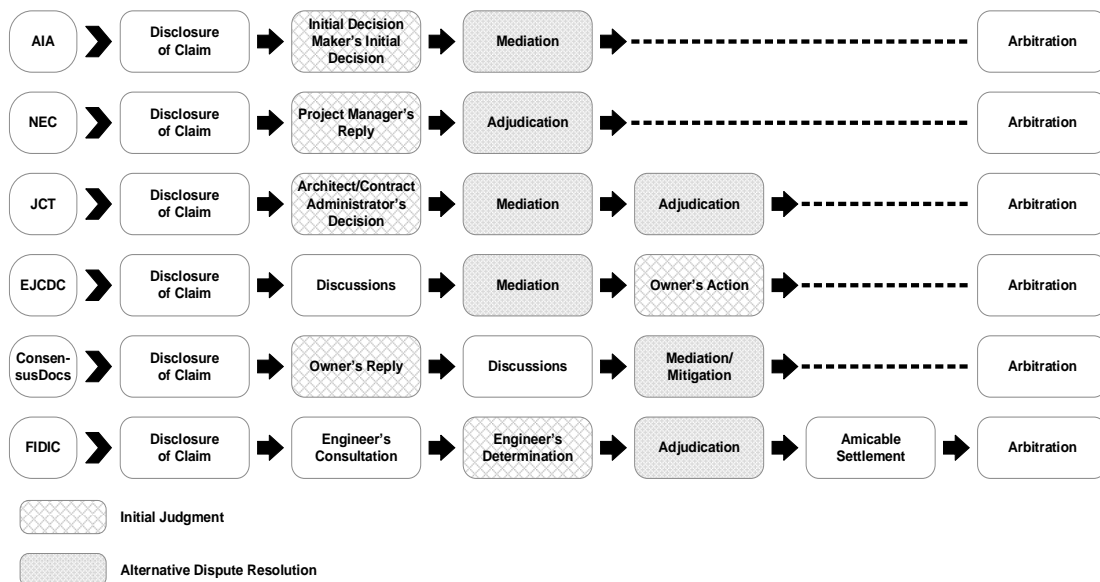


Figure 67. Claim/Dispute Resolution Mechanisms Spectrum

3. Deduced Steps' Operational Variations

As implied from Figure 10, the steps/phases underlying the studied mechanisms can be generally categorized into several groups. A detailed – and yet comprehensive – analysis applicable to each group was conducted to explore the corresponding operational variations prevailing across the studied standard mechanisms. As such, varying factors and their attributes were identified for each phase as in succession discussed below.

a. Disclosure of Claim Phase

The disclosure of claim is naturally the start-up phase for all mechanisms; it can be divided into two stages: (1) the notice of claim and (2) the supporting documents.

i. Notice of Claim

To initiate a claim under any of the examined sets of standard conditions, the claimant shall issue a notice of claim. However, the conditions that control this process vary depending on several factors, specifically in respect of (1) the time bar, (2) the triggering event, (3) the content, and (4) the consequence of failing to issue a notice of claim. These factors and their corresponding attributes are presented in Figure 68.

The allocated time bar for a claimant to submit a notice of claim ranges from a minimum of 14 days to a maximum of “reasonably apparent”, as stipulated under the ConsensusDocs and JCT conditions, respectively. Towards the lower end of the scale,

the stipulations by the AIA, the FIDIC and the EJCDC conditions fall, specifying the respective periods of 21, 28, and 30 days. On the other hand, NEC conditions fall towards the upper end, as it allocates a period of 56 days to furnish a notice of claim. Except for the case of NEC, all sets of standard conditions state that the corresponding time bars are triggered upon the start of the event giving rise to the claim. However, the triggering event under the NEC conditions is an event that happened or is expected to happen.

As for the content of the notice of claim, the claimant, under the FIDIC conditions, shall describe the event or circumstance that gave rise to the claim. In addition to the aforementioned requirement, the notice of claim for an extension of time under the JCT conditions shall include the causes of delay. On the other hand, the notice of claim under the AIA conditions is expected to be accompanied with supporting data. However, the AIA commentary guide, under § 15.1.2, clarifies that the “notice of claim needs not [to] contain all the information pertaining to the claim”. On the contrary, the EJCDC conditions requires the submission of accurate and complete supporting documents reflecting the full amount of the additional time and/or money claimed to be concurrent with the notice submission. Unlike the other sets, the ConsensusDocs and NEC conditions do not specify specific requirements as to the content of a claim notice.

To further regulate the claim/dispute process, the NEC and FIDIC conditions impose consequences for the failure of issuing a notice of claim within the stipulated time bar. In this regard, the NEC conditions indicate that the claimant shall not be

entitled for an extension of time and/or a reimbursement of additional incurred costs, unless the matter was caused by the owner’s personnel. On the other hand, the FIDIC conditions state that a claimant shall not be eligible for any entitlement if the claimant failed to issue a notice of claim within the allocated time bar, regardless of the root cause of the claim. The acceptance or validness of this condition-precedent claim notice is also stated to be contingent on the fulfillment of other prerequisite or concurrent notices called for under the event-related clauses of these conditions (Abdul-Malak and Khalife 2018).

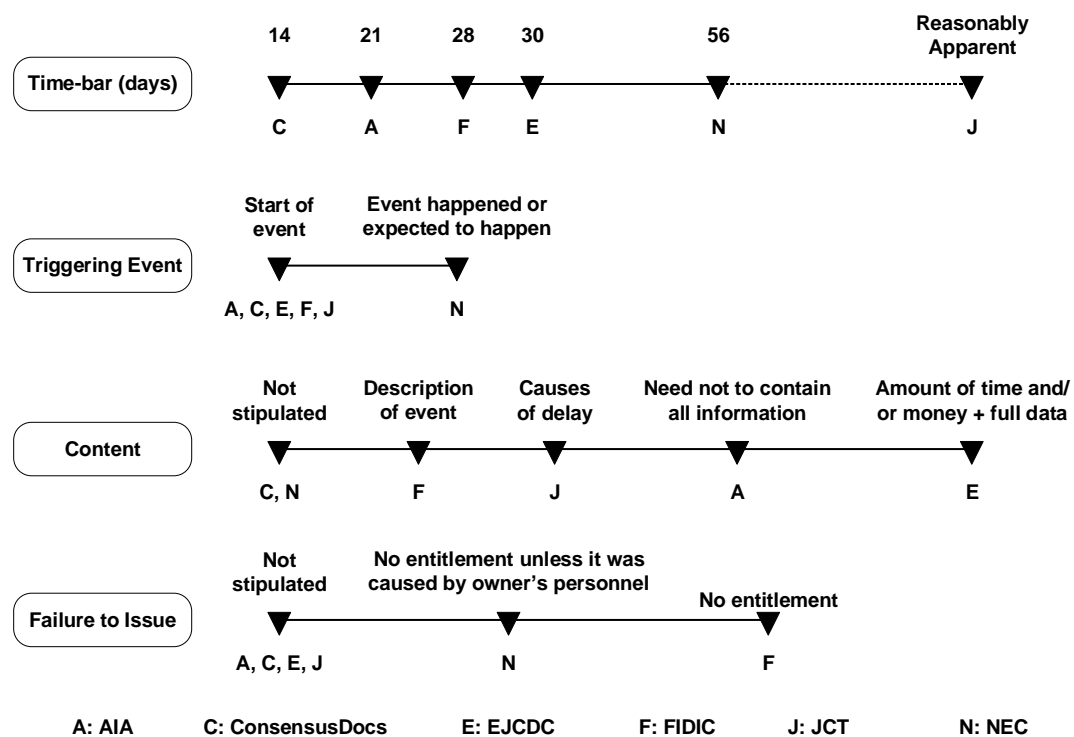


Figure 68. Notice of Claim Factors

ii. Supporting Documents

Following the submission of the notice of a claim, the claimant shall submit the corresponding supporting data to justify the alleged demands. The pertinent contract conditions revealed several operational variation factors, including (1) the maximum time available to prepare the supporting documents, (2) the extendibility of the allocated time-bar, (3) the consequences of failing to submit supporting data, and (4) the sequencing of the claim notice and supporting data submissions. These factors are laid out as shown in Figure 69.

Claimants need to prepare complete dossiers when submitting supporting documents if they are to increase their chances of expeditiously resolving a claim on hand. Hence, and taking into account the initial level of invested efforts corresponding to the nature of the undertaken analyses that are ideally inherent to the process of responsibly building the case for submitting a notice of claim (Abdul-Malak and Abdulhai 2017), one of the most important factors to subsequently inquire about is the maximum time available to fully prepare/finalize the supporting documents and make their submission. On the one end, the EJCDC, ConsensusDocs, and AIA conditions offer stipulations of somewhat comparable lengths, by allotting periods of 30, 35, and 41 days from the occurrence of the relevant event, respectively. On the other end, the FIDIC and the NEC conditions offer the claimant a longer duration of 84 days (also from the occurrence of the relevant event) to satisfy the detailed particulars requirement

of the claim in question. Only the JCT conditions qualitatively prescribe that the claimant submits the supporting data as soon as possible.

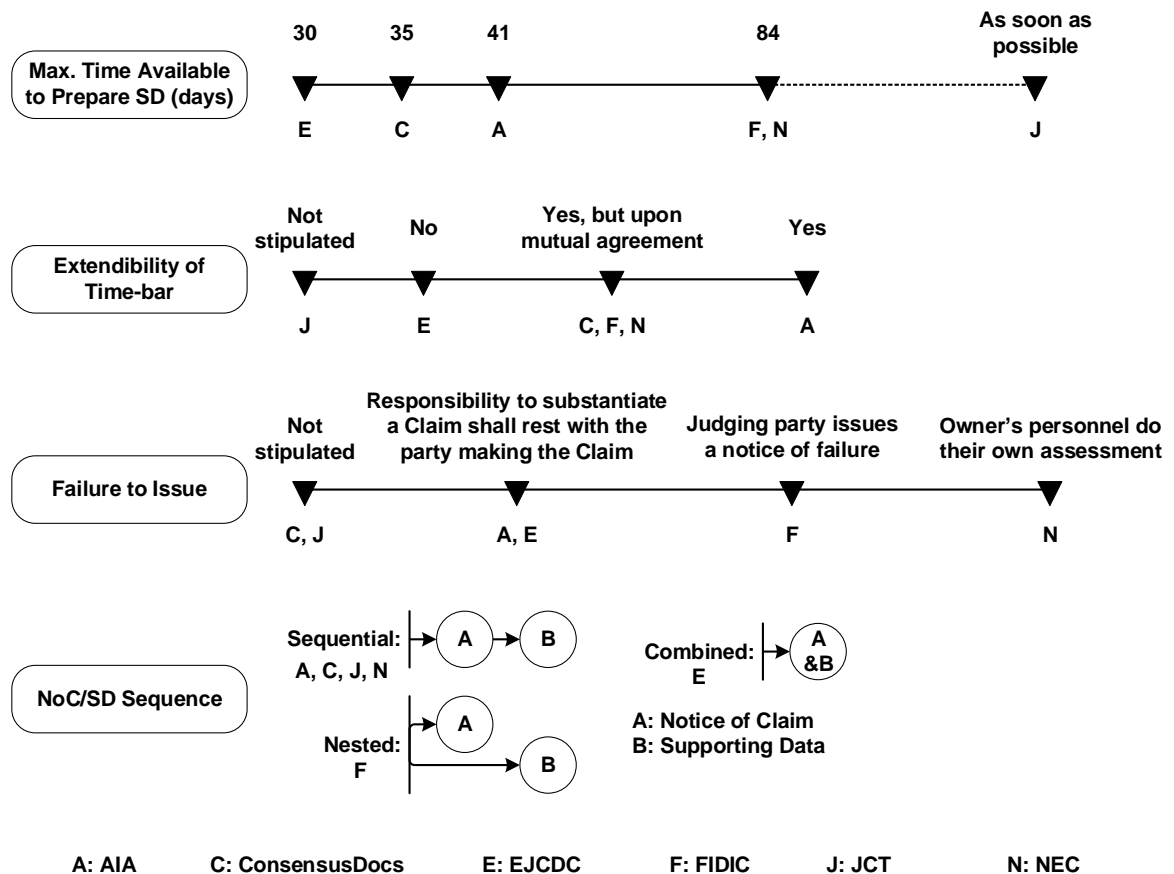


Figure 69. Supporting Documents Factors

Here, it is to be noted that the stipulated time bars can be extended under a number of the examined standard conditions sets. That is, the ConsensusDocs, FIDIC, and NEC conditions stipulate that the pertinent time bars can be extended through the mutual agreement of both parties to the contract. Moreover, the AIA conditions allow

the claimant to unilaterally extend the relevant time bar by informing the initial decision maker of the date by which the supporting data will be furnished. On the contrary and given that the submission of particulars is to be made with that of the claim notice, the EJCDC conditions do not as such offer this extendibility possibility and rather impliedly limit the time-bar duration to a maximum of 30 days. Finally, the JCT conditions do not indicate whether or not the time bar for submitting the supporting documents is possible to be extended.

Further treatments concerning the submission of these supporting documents include those by the AIA and EJCDC conditions, explicitly stipulating, under § 15.1.1 and Paragraph 12.01 B, respectively, that it shall be the responsibility of the party making the claim to provide substantiation for it. On the other hand, the FIDIC conditions apply an even more stringent mechanism, whereby the engineer is expected to issue a notice of failure, pursuant to Sub-clause 20.2.4, when the claimant fails to substantiate the contractual basis of the claim. In this case, the submitted notice of claim is accordingly no longer considered valid. On the contrary, the NEC conditions stipulates under “Clause 61.3” that the project manager shall do his/her own assessment if the contractor (the claimant) fails to make the supporting documents available within the time allowed.

Another factor that was inspected when comparing the studied sets of standard conditions is the sequence with which the time bars pertaining to both the claim notice and the supporting data phases operate. In this regard, three categories were revealed,

namely: (1) sequential time bars, (2) nested time bars, and (3) combined time bars. The time bars of these phases under the AIA, ConsensusDocs, JCT, and NEC conditions fall into the first category. However, this category can be further divided into three sub-categories: (1) automatically sequential, (2) sequential but subjected to an optional request, and (3) sequential but subjected to the approval of the notice of claim. To this effect, the notice of claim and the supporting documents time bars are viewed as automatically sequential under the JCT and ConsensusDocs conditions, wherein the time-bar for submitting the supporting documents is automatically triggered by submitting the notice of claim. In the AIA case, the initial decision maker, following the receipt of the notice of claim, can request the claimant to furnish further particulars, thereby triggering its corresponding time bar. Hence, the time bars of these two phases under the AIA conditions are sequential but they are subjected to the discretionary request by the initial decision maker for further particulars. Similarly, the aforementioned time bars are conditionally sequential under the NEC conditions. That is, following the submission of the notice of claim, the project manager shall indicate whether or not a change in the price, contract date, or key dates is applicable. If the notice of claim was approved, the project manager instructs the claimant to submit supporting documents. As such, the mentioned time-bars are sequential but contingent on the approval of the notice of claim. On the other hand, the FIDIC conditions adopt the nested options for these time bars, under which both time bars are triggered the moment the claimant became aware or should have become aware of the event or

circumstance giving rise to the claim. Finally, the case of the EJCDC conditions falls under the third category, as the related conditions stipulate that the notice of claim shall be accompanied by the supporting documents. As such, the EJCDC conditions fully combine both time-bars

b. Discussions Phase

Following the disclosure of claims and prior to the rendering of initial judgment, the EJCDC conditions and FIDIC conditions offer the parties a discussion phase to endeavor reaching agreement regarding the matter in question. On the other hand, a similar phase is available under the ConsensusDocs, but this is triggered following the rendering of the owner's reply. Two operational variation factors were detected regarding the discussion's phase: the allotted time bar and the operational mechanism.

The period of time allotted for the discussion phase under the ConsensusDocs conditions is limited to a maximum duration of 15 days and is, therefore, the shortest in comparison with other conditions. The discussions within this period are made directly with the owner but at two different levels. It starts at the level of the parties' representatives and shifts, if agreement was not reached, to the level of the parties' senior executives. The second shortest duration is stipulated under the FIDIC conditions whereby a maximum period of 42 days is allocated for consultations. There, the engineer is entrusted with conducting individual and/or joint consultation with the parties in an endeavor to reach agreement. On the other extreme, the EJCDC conditions

provide the longest duration as it assigns a 90-day period for discussions. Within this period, direct negotiations and exchange of information take place between the parties to the contract.

c. Initial Judgment Phase

Either directly after the disclosure of claim or following the discussion's phase, claim/dispute mechanisms require a judgment-rendering party to issue an initial judgment. The operational variation factors corresponding to this phase are illustrated in Figure 70, including: (1) the time bars and their potential extendibility, (2) the property of the rendered judgment, (3) the incorporation mechanism, (4) the requirements for giving justification, and (5) the consequences of the failure to render a judgment.

The time bar of the initial judgment's phase, under the spectrum of the examined standard claim/dispute resolution mechanisms, ranges from a minimum of 14 days, as stipulated under the ConsensusDocs and NEC conditions, to a maximum of 90 days, as specified under the EJCDC conditions. The time bars corresponding to this phase under the JCT conditions lie in between, with 28-day and 84-day figures assigned for the loss and expense claims and delay claims, respectively. On the other hand, the AIA conditions stipulate that the initial decision maker shall render his/her decision within a period of 30 days from the receipt of the notice of claim, whereas under the FIDIC conditions the engineer is to give a determination within a period of 42 days, a period triggered by the termination of the consultations phase. These time-bars are non-

extendable, except in the cases of the FIDIC and NEC conditions, under which extendibility is conditional on the parties' mutual agreement thereof.

The property of the initial judgment so rendered is specified only under the AIA, EJCDC, and FIDIC conditions. The latter states that the initial judgment is binding with the possibility of becoming final only if no notice of dissatisfaction with the engineer's determination was issued by any of the parties within the specified period of 28 days. On the other hand, the AIA and EJCDC conditions stipulate that the initial judgment is born as binding and final. However, this judgement's property of being 'final' can be revoked upon invoking the succeeding phase of the corresponding mechanism, i.e., mediation under the AIA conditions or arbitration under the EJCDC ones.

The approved part of the claim is incorporated via a payment certificate under the FIDIC conditions, an addition to the contract sum under the JCT conditions, and a change order under the other sets of the examined standard conditions. If the claim was rejected in part or in whole, all sets, except for the ConsensusDocs and EJCDC ones, necessitate the judgment-rendering party to justify any such given judgment in detail.

As the initial judgment is a condition precedent to the succeeding phase, there will therefore be consequences if the judgment-rendering party fails to act within the stipulated period. Under the AIA and EJCDC conditions, the claimant is allowed under such a scenario to proceed to the next stage at any time. That is, the initial decision under the AIA conditions will as such no longer be considered as a condition precedent to proceeding to mediation. Instead, an unregulated period will ensue, where the

claimant will be able to file for mediation at any time. Whereas in the EJCDC conditions, the contractor is offered the option of issuing a denial-of-claim letter, viewed as equivalent to the claim having been denied by the owner.

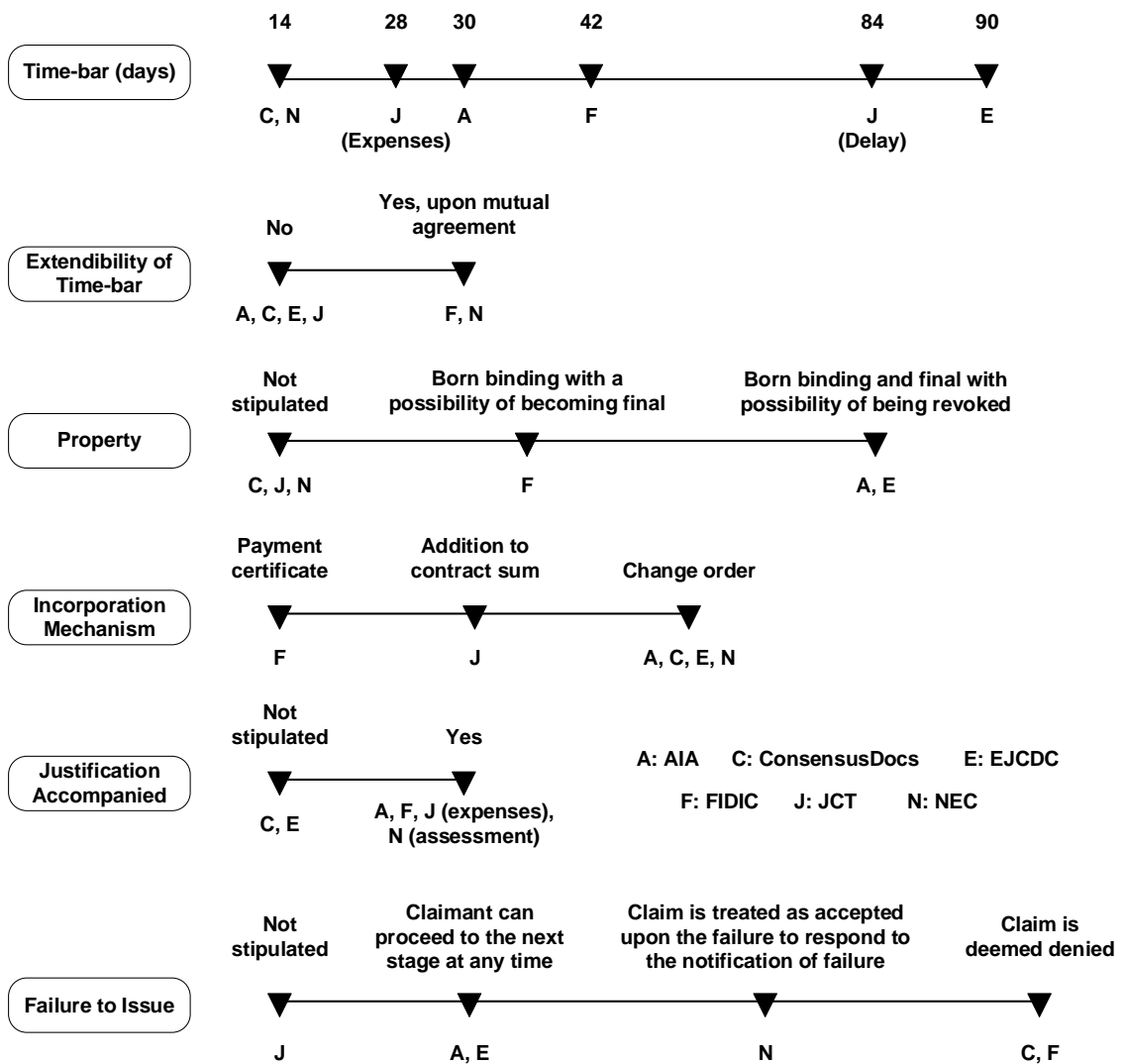


Figure 70. Initial Judgment Factors

On the other hand, the NEC conditions adopt a different mechanism, wherein the claimant can issue a notification indicating that the judgment-rendering party failed to act within the stipulated period. This notification triggers a new time-bar that offers the judgment-rendering party a second chance to act. Failure to do so is equivalent to rendering a judgment that has the effect of having accepted the claim. On the contrary, the claim is deemed denied in cases of failure to render a judgment under the ConsensusDocs and FIDIC conditions.

d. ADR Phase

The claim/dispute resolution mechanisms under all sets of standard conditions implement at least one ADR technique as an endeavor for reaching a resolution prior to referring the matters as disputes to arbitration. Among the available ADR techniques, the ones that are encountered to be more frequently used are mediation and/or adjudication.

i. Mediation

Mediation is adopted by all the studied sets of standard conditions, except for the NEC ones. However, the properties of the underlying mediation processes were found to vary from one set of conditions to the other. Therefore, several factors, governing the encountered operational variations, were investigated; these can be visited in Figures 71 and 72.

Typically, the first factor to be checked was the time bar allotted for this stage. The ConsensusDocs conditions specify that the mediation process shall convene within 30 days and end within 45 days, where both time bars are triggered from the date on which the first discussions were held. Hence, the mediation process arguably has a minimum duration of 15 days and a theoretical maximum of 44 days, assuming that the preceding phase of discussions consumed one day only. Although mediation shall be convened within the stipulated timeframe, either party is allowed to terminate the mediation process at any time after the first session. On the other hand, the AIA and the EJCDC conditions stipulate that the mediation process shall last for a minimum period of 60 days before being terminated by either party. However, mediation can be concluded by the mediator at any time if deemed unsuccessful. As such, the duration of the mediation process can be extended under these conditions if the mediation process was neither concluded by the mediator nor terminated by either party. On the contrary, the FIDIC and JCT conditions do not stipulate any specific requirement regarding mediation, although there seems to be room along their timelines for the parties to mutual agree to mediate, as outlines later.

As to the relative weight of this ADR technique, the AIA conditions mandate the referral of disputes to mediation, mediation is in fact a condition precedent to arbitration. This is also true of the ConsensusDocs conditions when mediation was the resolution process chosen instead of mitigation.

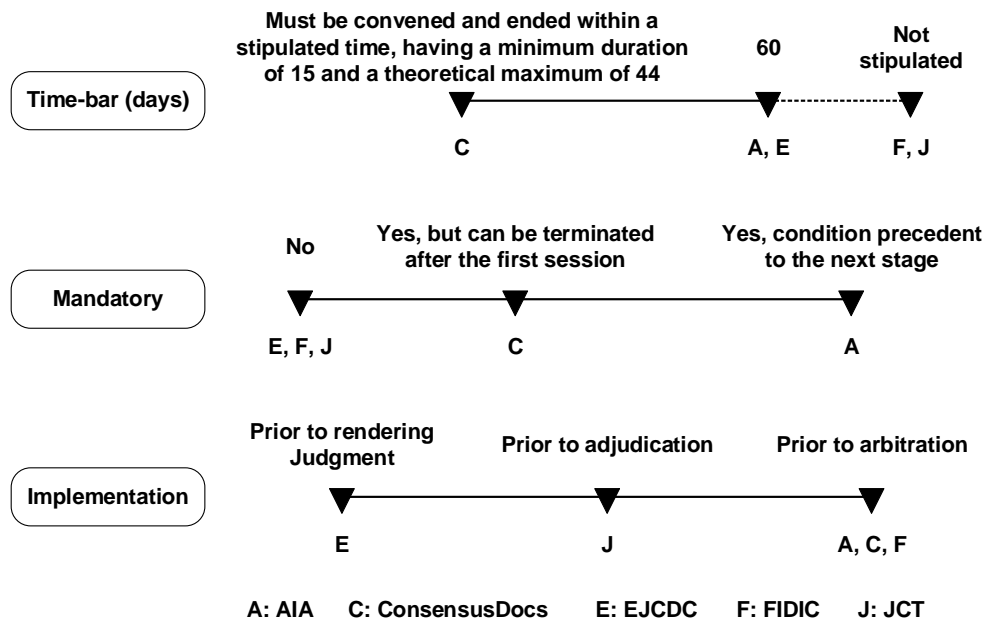


Figure 71. Mediation Factors (1/2)

Exceptionally under the EJCDC conditions, mediation is sequenced early on in the process and is allowed to stay the initial judgment phase. This is in contrast with what can be observed under all the other examined sets of standard conditions, which implement – or have room for implementing – mediation towards the end of the corresponding claim/dispute timelines. As a matter of fact, the JCT conditions may be seen as only allowing mediation to be conducted prior to adjudication, while the FIDIC conditions making that allowance as part of the amicable settlement stage. All the remaining sets mandate the referral of disputes to mediation prior to the initiation of arbitration.

The mediation process shall be initiated pursuant to the mechanism set forth in the relevant contract provisions. For illustration, the triggering of mediation under the EJCDC conditions is stated to be requiring the parties' mutual agreement. The same can be inferred for optionally adopting mediation and therefore triggering it under the FIDIC or JCT conditions. On the contrary, the AIA conditions allow either party to unilaterally file for mediation. Moreover, either party would be able to demand the other party to file for mediation if the initial decision maker rendered an initial decision within the allotted period. The advantage of this initiation mechanism is that it obliges the demanded party to file for mediation within a specific period. If that party failed to do so, both parties waive their right to pursue mediation or binding dispute resolution. On the other hand, the ConsensusDocs conditions do not require any party to initiate mediation. Instead, the used wording mandates the initiation of the mediation process within a stipulated period.

Except for the FIDIC and the JCT conditions, the other sets of standard contract conditions do not only regulate the mechanism for initiating mediation but also mandate a mechanism for closing it. Besides reaching agreement being a possible closure mechanism, the mediation process is seen to come to an end when it is either concluded by the mediator, if deemed unsuccessful, or terminated by one of the parties. As such, mediation can be concluded by the mediator at any time. This same privilege is offered to the parties under the ConsensusDocs conditions, as they can terminate the mediation process at any time directly after the first session. On the other hand, the AIA and

EJCDC conditions offer the parties the option to terminate but only upon the expiry of the allotted mediation period.

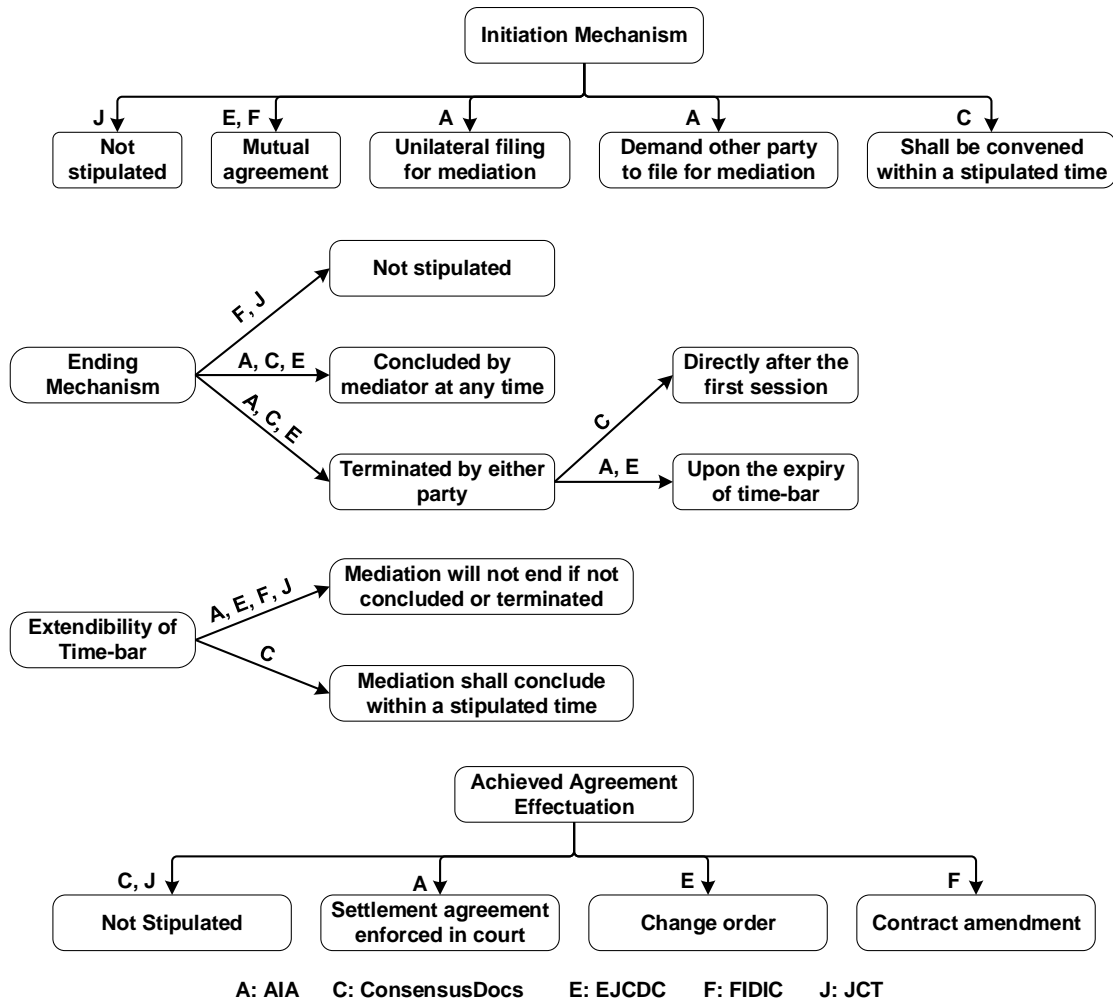


Figure 72. Mediation Factors (2/2)

Finally, the agreement reached through mediation is implemented differently. Under the AIA conditions, the settlement agreement shall be enforced in any court having the jurisdiction thereof (§ 15.3.4). The EJCDC conditions, namely “Paragraph

12.01.G”, stipulates that agreements shall be incorporated in a change order. The inferred operability of Sub-clause 21.5, concerned with the amicable settlement stage under the FIDIC conditions, calls for the agreement reached to be recorded in writing and signed by both parties. The signed agreement shall be binding on both parties and incorporated as an amendment the contract. On the other hand, the JCT and the ConsensusDocs conditions do not stipulate any implementation or incorporation mechanism regarding agreements reached through mediation or otherwise.

ii. Adjudication

Adjudication is another ADR technique that is found to be adopted in three out of the six studied sets of contract conditions, namely those published by the FIDIC, JCT, and NEC. However, some variations were observed to exist in the various stipulations used for this phase. The factors responsible for such variations are presented in Figure 73. To be reiterated is that the NEC conditions endorse two options for adjudication: option W1 or option W2 (as outlined earlier), depending on whether or not the United Kingdom Housing Grants, Construction and Regeneration Act 1996 applies.

Under each of the three sets, a two-step notice is required to initiate adjudication, requiring the referring party to issue a notice of adjudication followed by the referral of the dispute to adjudication. However, the allotted time bars for issuing the notices vary from set to another. The FIDIC conditions and Option W1 under the NEC conditions require the issuance of a notice of adjudication within a period of 28 days

from the date of issuance of the initial third-party assessment. Afterwards, the dispute shall be referred to adjudication between two to four weeks under Option W1 or within 42 days under the FIDIC conditions. On the other hand, the JCT conditions and Option W2 under the NEC conditions allow either party to trigger adjudication by issuing a notice at any time. Once the notice is issued, the initiating party shall refer the dispute to adjudication within 7 days. If the notices were not furnished within the stipulated time bars, parties will no longer be able to pursue adjudication.

Under the NEC and JCT standard conditions, the appointed adjudicating party is a sole adjudicator. The FIDIC conditions, on the other hand, provide flexibility for the parties to opt to appoint a dispute avoidance/adjudication board, which consist of three members. The NEC and JCT conditions allow the sole adjudicator a period of 28 days to render a decision, while the FIDIC conditions allocate a period of 84 days to carry out such a role. The decision rendered under the FIDIC and NEC conditions is said to be binding with the possibility of becoming final if neither party issued a notice of dissatisfaction within a stipulated period. Conversely, under the JCT conditions, the parties can issue the notice of dissatisfaction with respect to the adjudicator's decision at any time, Hence, it is taken that the rendered decision is binding with no possibility of becoming final. Under these conditions, if the adjudicator fails to act within the stipulated period, that adjudicator is considered resigned and a new one shall be appointed to carry out this duty. On the other hand, the FIDIC and NEC conditions treat the lack of an adjudication decision by giving either party the right to issue a notice of

dissatisfaction, thus permitting the progression of the dispute on hand to arbitration.

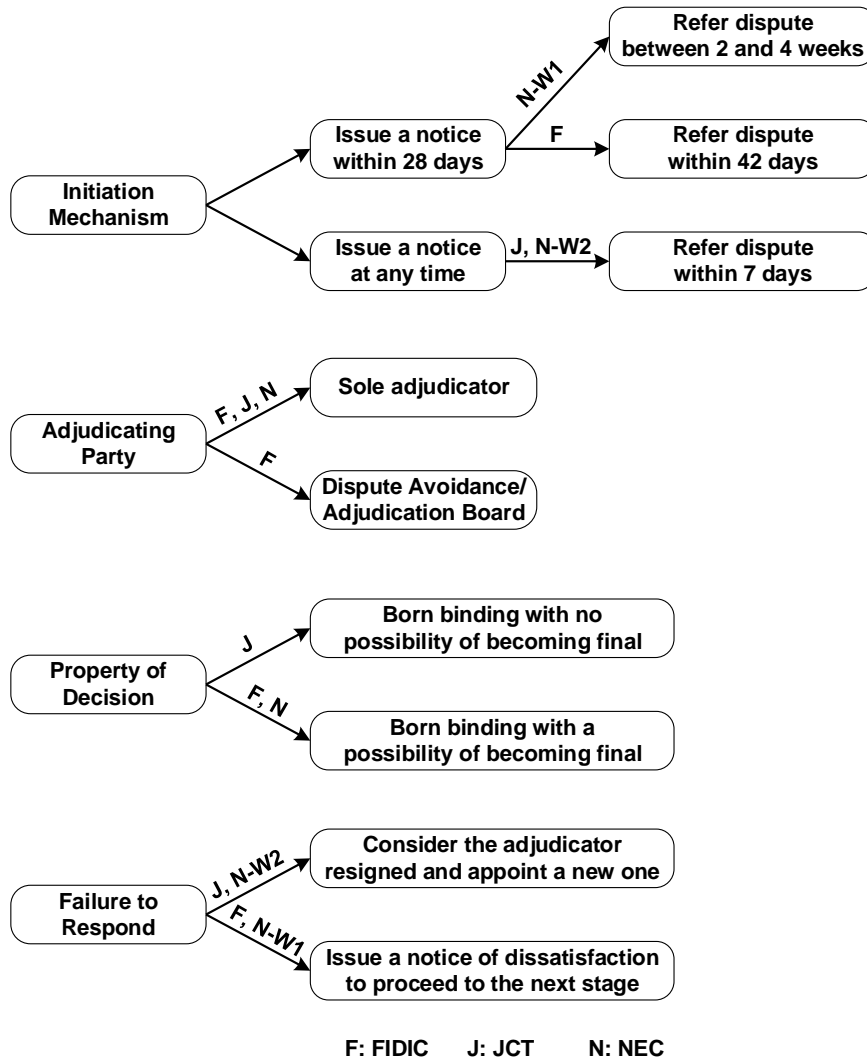


Figure 73. Adjudication Factors

e. Other Phases

Apart from the mediation and adjudication phases, as discussed above, other stages were observed that are individually unique to one set or another of the examined standard conditions. These involve the cases of the mitigation phase, under the ConsensusDocs conditions, and the amicable settlement phase, under the FIDIC conditions. Instead of choosing mediation as the claim/dispute resolution technique under the ConsensusDocs conditions, the parties may opt to choose mitigation. Under this option, the parties shall refer the matter in dispute either to a “neutral” or a “dispute review board”. The roles expected of these dispute resolution professionals are similar to the ones of the sole adjudicator or dispute adjudication board members. However, the recommendations rendered by these professionals as part of the mitigation phase are non-binding on the parties to the contract. The other unique phase is that of amicable settlement, which is adopted by the FIDIC conditions and sequenced to take place just prior to commencing arbitration. During this phase, the parties shall endeavor to resolve claims amicably, possibly using any ADR technique other than that of adjudication, given the fact that adjudication is the stage immediately preceding this amicable settlement stage under the FIDIC conditions. To be noted is that the parties’ mutual agreement is necessary for the initiation of any ADR technique during this stage, taking also into consideration that the specified period of 28 days may be extendible upon the parties’ mutual agreement, which can serve to possibly accommodate for the time needed to initiate, conduct, and conclude the adopted ADR proceedings.

4. The All-Encompassing Claim/Dispute Mechanism

The analysis of the deduced spectrum of the encountered claim/dispute resolution mechanisms revealed an array of variations regarding the sequencing and the operational aspects of the respective phases. Besides, the conducted analysis resulted in the identification of the full continuum of all the possible phases that could possibly be parts of a desired claim/dispute resolution mechanism. This inferred continuum of all possible phases contributed to the formulation of an all-encompassing mechanism, as illustrated in Figure 74.

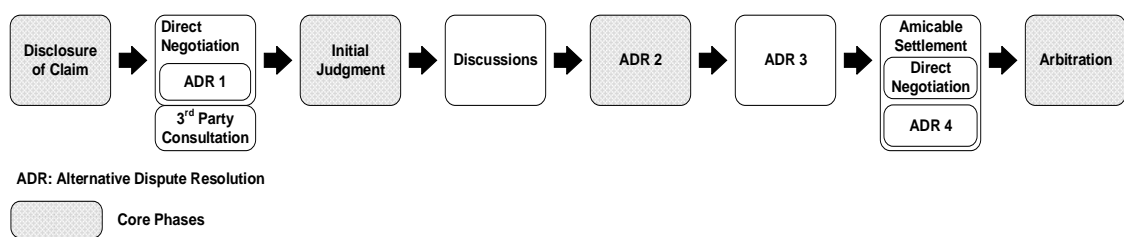


Figure 74. The All-Encompassing Claim/Dispute Timeline

This inferred holistic mechanism is shown to a set of core phases that were found to be present under all studied standard claim/dispute resolution mechanisms. In fact, all mechanisms are initiated once a claim is disclosed, which is eventually settled by arbitration if no earlier resolution was possible, thereby naturally making the phases of disclosure of claim and arbitration as core ones in the all-encompassing mechanism. Moreover, there shall at least be a judgment rendered as to the eligibility and quantum

of the submitted claim. As such, the initial judgment phase is referred to as another core phase. Finally, a reasonably conceived claim/dispute resolution mechanism shall adopt an ADR technique in order to offer the disputing parties a chance to reach agreement, as opposed to allowing the direct referral of disputed claims to arbitration. However, as it was inferred from the above analyses and mapped out in Figure 75, there are four different situations along which an ADR technique could be applied.

	Alternative Dispute Resolution 1	Alternative Dispute Resolution 2	Alternative Dispute Resolution 3	Alternative Dispute Resolution 4
AIA		Mediation		
ConsensusDocs		Mediation/ Mitigation		
EJCDC	Mediation			
FIDIC		Adjudication		Mediation/ Facilitation/ Conciliation
JCT		Mediation	Adjudication	
NEC		Adjudication		

Figure 75. Rooms for ADR

The first ADR situation is located directly after the phase of claim disclosure and prior to that of initial judgment. Actually, this situation is an option nested within the discussions phase of the claim/dispute resolution mechanism as stipulated under the EJCDC conditions, during which the parties may mutually opt to refer a claim to mediation. The second situation for ADR is positioned after the rendering of the initial judgment. Most of the studied standard mechanisms stipulate the use of an ADR technique in this location. Therefore, it is considered as one of the core phases of the deduced all-encompassing timeline. At this location, the AIA, ConsensusDocs, and JCT conditions select mediation as the chosen ADR. On the other hand, the ConsensusDocs conditions allow the parties to instead adopt another ADR technique, that of mitigation. As for the FIDIC and NEC conditions, this location is dedicated for conducting adjudication.

Under certain sets of the examined standard contract conditions, more than one ADR technique is prescribed. In fact, a third location for an ADR method can be made available directly after the second one. That is, the JCT conditions stipulate that disputes unresolved through mediation shall be referred to adjudication, prior to commencing arbitration. On the other hand, the claim/dispute resolution mechanism under the FIDIC conditions adopt an amicable settlement phase, located prior to arbitration. Under this phase, parties can refer a dispute to any ADR technique, including but not limited to facilitation, conciliation, or mediation. Alternatively, the parties may as well conduct direct negotiations during this phase. As such, this phase was added to the holistic

timeline, in which it occupies a forth possible location for an ADR technique and/or a direct negotiation phase.

The last category of phases that shall be added to have a full continuum is the discussion phase. Different claim/dispute resolution mechanisms sequence the discussion phase at different locations. Firstly, the EJCDC conditions cause the parties to go through a discussions phase prior to the issuance of an initial judgment. At the same location, the FIDIC conditions mandate that the engineer conduct consultations with the parties to the contract, prior to proceeding to the engineer's determination stage. Secondly, the ConsensusDocs conditions locate a discussion phase after the rendering of an initial judgment, thus obliging the parties to go through discussions prior to referring disputed matters to ADR. The last situation where discussions are presented is under the FIDIC conditions, where parties may initiate direct discussions within the amicable settlement phase in an endeavor to reach agreement.

5. Practical Implications of the Constructed All-Encompassing Timeline

The conducted analysis revealed the operational variations of all phases that could possibly be encountered under any of the standard claim/dispute administration timelines. This performed analyses and made deductions and inferences can be of great value to contract administration professionals functioning under both owners and contractors of construction projects. On the one hand, instead of being exposed to only one set of contract conditions, owners and their contract administration practitioners can

benefit immensely when being informed of, and becoming fully familiar with, the full spectrum of possible mechanisms and their associated operational variations. The proposed all-encompassing timeline affords owners an unprecedented opportunity to custom-tailor their contracts' claim/dispute resolution mechanisms, without jeopardizing the integrity of any chosen/preferred design. On the other hand, while grasping the chance to be much better informed of what the reasonable claim/dispute mechanisms may ideally be comprised of, construction contractors shall be able to better benchmark the mechanisms included in projects' tender documents and possibly improve their contract terms negotiation position prior to executing the construction contract.

C. Judgements Rendered by Engineering Professionals

Claims and disputes arising under construction contracts are tracked, expedited, and resolved using mechanisms specified under contract clauses dedicated for that purpose. Consequently, all key project participants end up being inevitably engaged in such a demanding process and over a long period of time that may surpass that of a project's construction duration. Depending on the conditions of contract adopted, different roles must be exercised by engineering professionals throughout the claim and dispute administration process. Cheeks illustrated how dispute resolution processes evolved from a two-step process to a multistep process where more roles have been introduced (Cheeks 2003). Shedding the lights on one such role, Ndekugri et al. examined the role

of engineer under the standard conditions of contracts by the International Federation of Consulting Engineers (FIDIC). They compared this role under the old and new FIDIC to highlight the corresponding changes (Ndekugri et al. 2007). In addition, the evolution of the claims and disputes documentation along such a contemporary multistep resolution approach has been recently studied, taking into consideration the alternating roles played by engineering professionals as part of such a lengthy process (Abdul-Malak and Abdulhai 2017). On the other hand, Iyer and Satyanarayana investigated clauses having the “final and binding” property. Moreover, they formulated guidelines for taking appropriate decisions with respect to disputes arising due to the triggering of such clauses (Iyer and Satyanarayana 2002). However, much remains to be answered as to the types and nature of opinions, assessments, determinations, decisions, and similar judgements, which are expected to be rendered by engineering professionals in various capacities along various possible claims and disputes evolution timeline. Thus, it is the objective of this paper to address this exact wider spectrum of roles that the engineering professionals may be called to exercise and the properties and features likely to be associated with any such roles.

1. Methodology and Contributions

The engineering professional may be asked to play more than one role within a multistep claim/dispute mechanism, either under the same project or even concurrently under the settings of different projects. This paper examines the roles engineering

professionals are required to exercise under six standard sets of contract conditions, namely those by the FIDIC, EJCDC, AIA, ConsensusDocs, JCT, and NEC. The adopted methodology is presented in Figure 76.

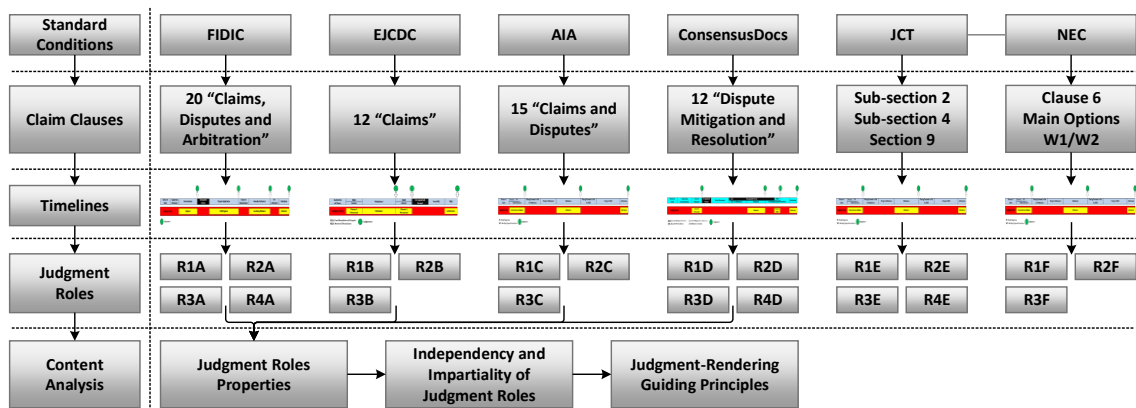


Figure 76. Research Methodology

The methodology involved (1) reviewing those clauses that prescribe the claim/dispute mechanisms, (2) extracting the corresponding claim timeline stages that show the process flow of claims and disputes, (3) pinpointing the judgement-rendering roles to be exercised under each timeline, and (4) identifying the judgement type and its property. The findings and contributions of this paper are presented through the performed in-depth content analysis, highlighting (1) the different deduced judgement-rendering roles and the corresponding capacities under which they are fulfilled, and (2) the general attributes that any engineering professional must be guided by when issuing any such judgment as called for by the corresponding role.

2. Engineering Professional Roles

a. Roles under FIDIC Conditions

The standard contract conditions by the FIDIC, being endorsed by the World Bank, are known for their widely use on international projects. Clause 20 “Claims, Disputes and Arbitration” was fully examined and the stages of the claim process extracted, as illustrated in Figure 77 (FIDIC 2000). Upon the occurrence of certain events, the contractor may become entitled for additional time and/or payment, subject to the fulfillment of the claim notice and supporting particulars requirements. The engineering professional working under these conditions will first serve as the “Engineer”, where he is expected to render a determination regarding the alleged claim. Once it is issued, the determination is said to be binding upon both parties, unless and until it is revised at a later step of the dispute resolution process. Although it is viewed as binding, such an issued determination can never gain the status of being final. Subsequent to the issuance of a determination, the claim may fall into an unregulated period until such time when the contractor refers the claim as a disputed matter to the dispute adjudication stage that follows.

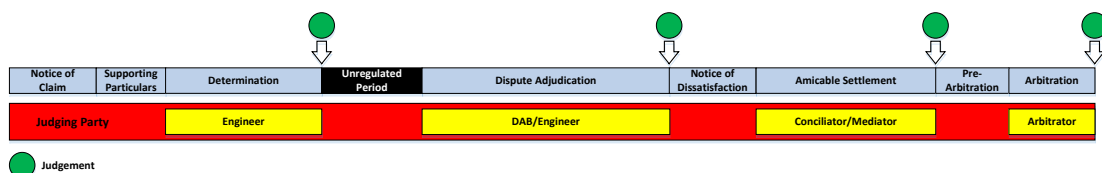


Figure 77. FIDIC Claim Process Stages

Upon making this referral, several roles are called for therein to be exercised by the engineering professional. First, the engineering professional acting as adjudicator is expected to render a pre-arbitral decision in reference to the referred dispute. The kind of judgement rendered at this stage is born as binding with the possibility of becoming final in case a notice of dissatisfaction in respect of the issued adjudication decision is not issued within the stipulated period of 28 days by either party. This adjudication process can be administered using either a full-term dispute adjudication board (DAB) or an ad-hoc one. Under a full-term DAB, the parties may mutually agree to seek the DAB's opinion to assess the case on hand prior to requesting a binding decision. Opinions rendered as such by DABs are born as nonbinding. If any of the parties is not satisfied with the adjudication judgement and issues a notice of dissatisfaction to that effect, the amicable settlement stage is then triggered, in which the parties have 55 days to attempt to resolve disputes amicably. At this stage, parties could opt to rely on alternative dispute resolution techniques, such as conciliation or mediation. Using either procedure, the parties shall endeavor to reach agreement, failure of which shall then trigger the issuance of a nonbinding recommendation by the appointed conciliator or mediator. If the dispute remains unresolved throughout all the afore-mentioned stages, it may then be referred to arbitration. Under such a proceeding, engineering professionals may act as arbitrators, as part of the dispute arbitration tribunal, where a judgement in the form of an "award" is to be rendered, which is directly born as binding and final.

The types of judgements identified above, along with their corresponding properties are summarized in Table 14.

Table 14. Judgements Rendered Under FIDIC

Role Played	Judgement	Property
Engineer	Determination	Born Binding with no Possibility of Becoming Final
Adjudicator	Opinion	Born Nonbinding
	Decision	Born Binding with Possibility of Becoming Final
Conciliator/ Mediator	Recommendation	Born Nonbinding
Arbitrator	Award	Born Binding and Final

b. Roles under EJCDC

This section reports on the examination of the claims- and disputes-related terms of the American-based standard contract conditions prepared by the EJCDC. The EJCDC’s claim mechanism is covered through Article 12 “Claims”, with the stages of the claim/dispute process are as indicated in Figure 78 (EJCDC 2013). If a contractor, working on a project where the EJCDC conditions of contracts have been adopted, thinks that he is eligible for additional payment and/or time, he must submit a claim to the owner directly. The submission shall include a notice accompanied by supporting documentation. Once the claim dossier is submitted, the review and resolution stage is triggered. Both parties, the owner and contractor, negotiate directly and exchange information as part of an attempt to resolve the claim. If the owner is ready to take

action based on the documentation made available by the contractor, the owner’s own personnel shall then render an action indicating if the claim has been approved or denied, whether in whole or in part. The issued action is born as binding and final. However, the contractor has the option of revoking the “final” property of such action by invoking the final resolution of dispute stage. Alternatively, both parties can opt to jointly agree to have the matter referred to mediation. Triggering the mediation stage shall stay the claims submittal and response procedures. In other words, the owner will then not be able to take any action as long as the mediation process is not yet concluded or closed. The claim can get resolved if mutual agreement is reached through mediation. If not, the mediator shall then conclude the mediation process, and he may as well produce a recommendation that is nonbinding for both parties.

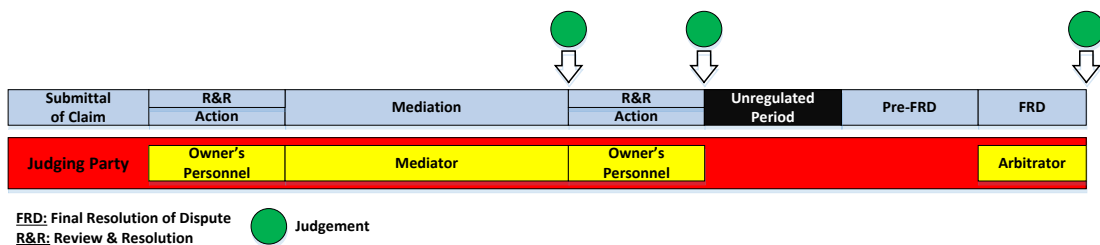


Figure 78. EJCDC Claim Process Stages

To be noted is that the EJCDC terms do not go to the specifics as to how the mediation process can be concluded and do not indicate the issuance of a recommendation by the mediator as a requirement. However, based on common

practice, the mediation process' terms of reference are likely to include such a requirement. Ending the mediation process has the effect of allowing the response procedure to resume, thereby giving a window for an action to be made by the owner. If an action is not issued within 90 days, the claim then falls into an unregulated period until any of the parties decides to end this stage by submitting a denial-of-claim letter indicating that the claim is deemed denied as a result of the inaction. When any of the two above-mentioned actions is taken, be that by owner's own personnel or the denial-of-claim letter by either of the parties, the contractor then has 30 days to invoke the final resolution of dispute stage (i.e., the arbitration stage). As stated earlier, an arbitration proceedings award is directly taken as binding and final. A summary of the judgements to be possibly rendered by engineering professionals under the EJCDC claims and disputes timeline is presented in Table 15.

Table 15. Judgements Rendered Under EJCDC

Role Played	Judgement	Property
Owner's Own Personnel	Action	Born Binding and Final with Possibility of Being Revoked
Mediator	Recommendation	Born Nonbinding
Arbitrator	Award	Born Binding and Final

c. Roles under AIA

The AIA's set of standard contract conditions was also examined for the same purposes, with focus given to Article 15 "Claims and Disputes". The extracted sequence of stages,

including the inherent judgement-rendering roles that may potentially be exercised, is depicted in Figure 79 (AIA 2017). Under this process, contractors claiming for additional time and/or money shall submit a notice of claim to the owner and the initial decision maker (IDM). Upon the receipt of the issued notice, the IDM shall look into the matter and take one or more of the following actions: (1) request the contractor to submit supporting data; (2) request the owner to submit a response and supporting data; (3) approve the claim; (4) deny the claim in part or in whole; (5) propose a compromise; or (6) advise the parties that he is unable to resolve the claim. If the IDM requests further supporting documents or a response from the owner, it is possible for the IDM to render his initial decision upon receiving the requested data. This initial decision is born as binding and final with the possibility of the final attribute to be revoked through mediation. Within 30 days after the day on which the initial decision has been rendered, either party may place a demand for the other party to file for mediation. If this demand is placed and the other party fails to file for mediation within 30 days, then both parties wave their rights for pursuing mediation or any further action regarding the matter and the initial decision rendered in respect thereof. On the other hand, if neither party sets a demand for the other party to file for mediation within 30 days from the day on which the initial decision is rendered, the claim then enters an unregulated period, which either party can end at any time by filing for mediation.

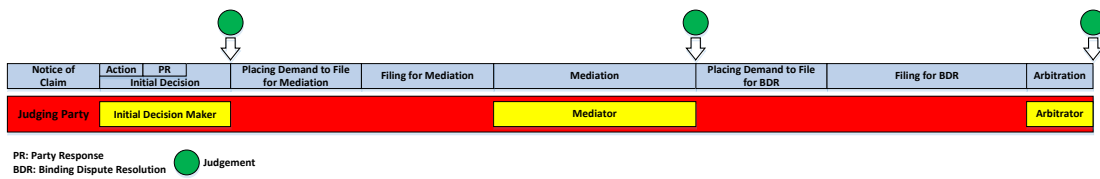


Figure 79. AIA CLaim Process Stages

Upon filing for mediation, the parties shall endeavor to resolve the claim, but if agreement is not achieved, the mediator can conclude the mediation process and may issue a recommendation. Similar to the EJCDC case, the rendering of a recommendation-type judgement is not explicitly stated. Again, a recommendation rendered by mediation is born as nonbinding. Ending mediation has the effect of allowing the dispute to move forward to the binding dispute resolution stage, where arbitration can be pursued. The mechanism adopted within these stages is exactly as that of mediation. That is, the binding dispute resolution stage can be initiated if: (1) a demand is placed by either party within 30 days after ending of mediation, and the other party files for arbitration within 30 days after the placement of this made demand; or (2) neither party places a demand within 30 days after ending of mediation, thereby allowing either party to file for arbitration at any time thereafter. Finally, it is reiterated that an issued arbitration award is viewed as binding and final. The judgements deduced as possibly being rendered by engineering professionals under the AIA’s claims and disputes timeline are summarized under Table 16.

Table 16. Judgements Rendered Under AIA

Role Played	Judgement	Property
IDM	Initial Decision	Born Binding and Final with Possibility of Being Revoked
Mediator	Recommendation	Born Nonbinding
Arbitrator	Award	Born Binding and Final

d. Roles under ConsensusDocs

The third American-based set of standard contract conditions, examined alongside those by the EJCDC and the AIA, was that of the ConsensusDocs. Under this set, Article 12 “Dispute Mitigation and Resolution” describes the claims and disputes process to be followed and administered in case the contractor alleges entitlements for additional money and/or time, as illustrated in Figure 80 (ConsensusDocs 2017). A contractor can initiate a claim by submitting a written notice to the owner directly. The notice must be followed by the submittal of supporting documentation. Based on the received documentation, the owner must render a response denying or approving the claim in part or in whole. To be noted in that the property (binding, final, or both) of this judgement is not stipulated. After rendering such a response, the claim enters an unregulated period, a stage which can be ended only if the parties mutually agree to initiate discussions aimed at reaching agreement.

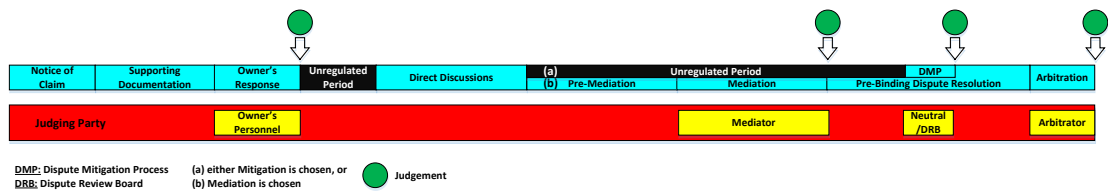


Figure 80. ConsensusDocs Claim Process Stages

Failure to resolve a claim through direct discussions triggers a process of either mitigation or meditation, depending on what has been specified in the contract conditions. As in the previous cases, unsuccessful mediation may result in a recommendation-type judgement being put forward by the mediator, a stipulation that is not made explicit under these conditions. On the other hand, when mitigation is stipulated under the contract, the dispute is to be referred to one of the two possibilities of a project neutral or a dispute review board, depending again on which option has been chosen under the contract. Either dispute mitigation process must render a finding that is born nonbinding on both parties. If the dispute is not resolved under mediation or mitigation, as the case may be, any of the parties may then refer the matter to arbitration to have a binding and final award-type judgement rendered. The engineering professional judgement-rendering roles identified under the ConsensusDocs' relevant standard conditions, and their corresponding properties, are listed in Table 17.

Table 17. Judgements Rendered Under ConsensusDocs

Role Played	Judgement	Property
Owner's Personnel	Response	Not Stipulated
Mediator	Recommendation	Born Nonbinding
Project Neutral, or DRB	Finding	Born Nonbinding
Arbitrator	Award	Born Binding and Final

e. Roles under JCT

Beside the international and the American sets of standard conditions, the British ones were examined. Starting with the JCT conditions, the claim resolution mechanism is stipulated under “Sub-section 2 Adjustment of Completion Date” and “Sub section 4 Loss and Expense”, while that of disputes is described under “Section 9 Settlement of Disputes” (JCT 2016). The underlying process and the accompanied roles that could be exercised by the engineering professionals are illustrated in Figure 81.

To initiate a claim, the claimant shall issue a notification of claim and submit the corresponding particulars to the architect/contract administrator, where the latter shall issue a decision, regarding claims for the adjustment of completion date, or an ascertained amount, regarding claims for losses and/or expenses. However, the properties of both judgments were not stipulated.

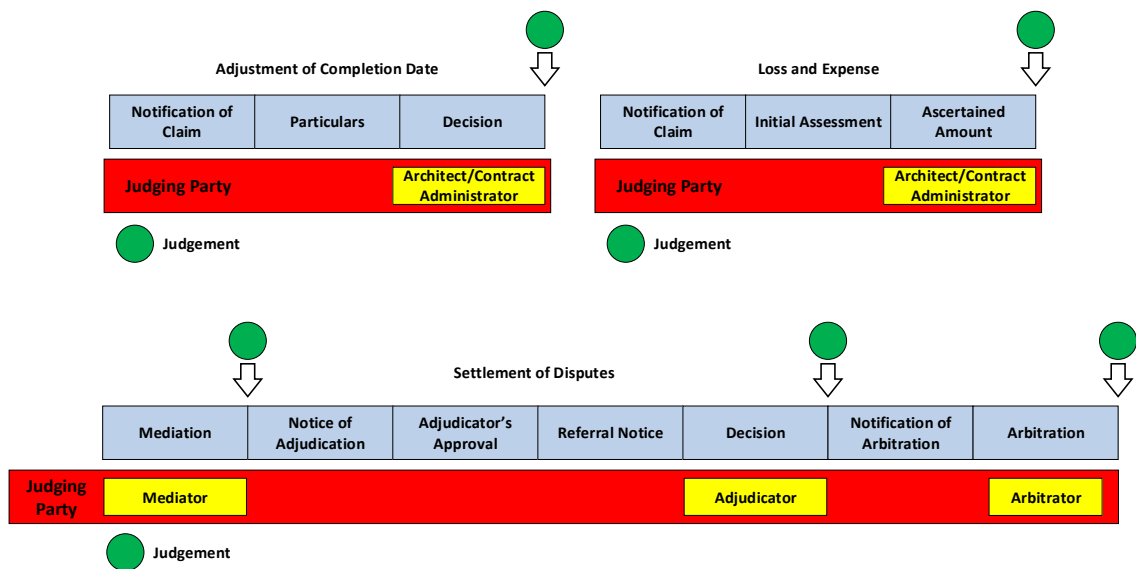


Figure 81. JCT Claim/Dispute Process Stages

If either party was not satisfied with the initial judgment of the architect/contract administrator, the process of settling disputes shall be followed to resolve the matter. As such, both parties may mutually agree to refer the matter to mediation in an endeavor to reach agreement. Although it not stipulated in the conditions, the mediator, as a common practice, shall issue a recommendation if no agreement was reached. The recommendation is a nonbinding judgment. If no agreement was reached or if parties did not agree to initiate mediation, either party can refer matter to adjudication. Under this process, the adjudicator shall render a decision that is born as binding. If either party was not satisfied with the adjudicator's decision, he/she can refer the dispute to arbitration at any time. As such, it was inferred that there is no possibility for the adjudicator's decision to become final. On the contrary, the arbitrator renders an award

that is born as binding and final. The discussed judgments and their properties are summarized in Table 18.

Table 18. Judgements Rendered Under JCT

Role Played	Judgement	Property
Architect/Contract Administrator	Decision	Not Stipulated
	Ascertained Amount	Not Stipulated
Mediator	Recommendation	Born Nonbinding
Adjudicator	Decision	Born Binding with no Possibility of Becoming Final
Arbitrator	Award	Born Binding and Final

f. Roles under NEC

Similar to the JCT conditions, the claim/dispute resolution mechanism is stipulated under two clauses. In fact, the process of claims resolution is described under “Clause 6 Compensation event”, while that of disputed is specified under either “Main Option W1” or “Main Option W2” (NEC 2013). These processes and the relevant roles that could be exercised are presented in Figure 82.

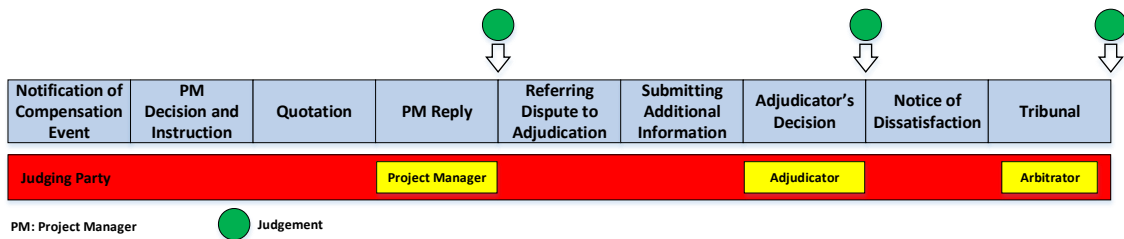


Figure 82. NEC Claim/Dispute Process Stages

Under this process, three roles could be exercised by an engineering professional. Firstly, there exist the role of the project manager, where the latter shall issue a reply regarding the submitted claim. However, the property of this judgment was not specified. The role of the adjudicator comes in the second position, where he/she shall render a decision regarding the matter referred to adjudication. The adjudicator's decision is born as binding with a possibility of becoming final if neither party referred the dispute to arbitration within the specified time-period. Finally, an engineering professional can be appointed as an arbitrator to render an award, that is born as binding and final. These judgments are tabulated in Table 19.

Table 19. Judgements Rendered Under NEC

Role Played	Judgement	Property
Project Manager	Reply	Not Stipulated
Adjudicator	Decision	Born Binding with Possibility of Becoming Final
Arbitrator	Award	Born Binding and Final

3. Role Capacities and Judgement Properties

In exercising the various judgement-rendering roles identified above, the concerned engineering professionals engaged at the successive stages of any of the examined claims and disputes timelines end up acting under different capacities. These capacities can be characterized by the level of independency overshadowing the engineering

professionals' engagements with the owners and, subsequently, the degree to which these professionals are required to act impartially in rendering their judgements. The upper part of Figure 83 depicts the full spectrum of roles under which the engineering professionals are found to likely assume during the claims and disputes tracking and administration process. In conjunction with this depicted variety of roles, the figure's middle and lower parts offer a characterization for each of these roles in respect of the degrees of independency and impartiality with which the individual roles are exercised.

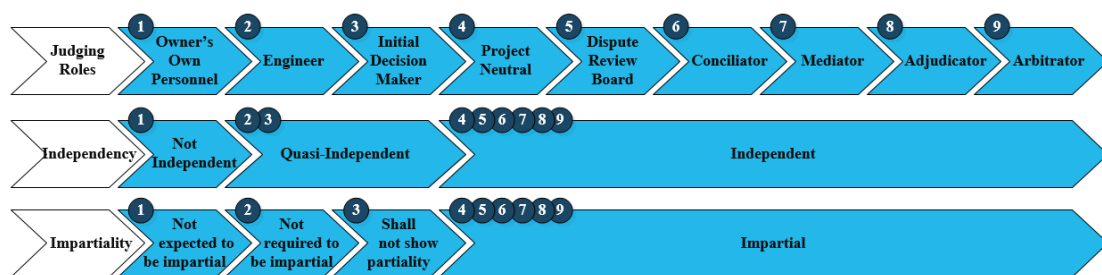


Figure 83. Independency and Impartiality Scales

It can be seen that when assigned to exercise any of the above-shown roles, the engineering professional could be characterized as being: (1) not independent, (2) quasi-independent, and (3) independent. An engineering professional identified as one of the owner's own personnel cannot be viewed to be acting in independency from the owner. Consequently, a professional working under this role shall not also be expected to act impartially. On the other hand, an engineering professional assigned by the owner to act as the "Engineer: under the construction contract can be viewed as quasi-independent.

That is, although the “Engineer” is presented as a third party with roles to be fulfilled under the construction contract, he is nevertheless appointed by the owner and may as well be defined as being a member of the owner’s personnel, as per the FIDIC’s conditions, hence the term quasi-independent. Therefore, the “Engineer”, seen as quasi-independent, shall not normally be required to act as an impartial intermediary when rendering judgements, unless it is stated otherwise in the contract’s particular conditions (FIDIC 2000). The discussion pertaining to the FIDIC’s engineer’s quasi-independency similarly applies to the case of the IDM under the AIA’s conditions, the architect/contract administrator under the JCT’s conditions, and the project manager under the NEC’s conditions. However, under the AIA conditions, it is stated that the IDM shall not show partiality to any party when rendering any judgement (AIA 2017), thereby representing a disparity from the FIDIC’s general conditions that consider the Engineer to be “acting for the owner” when giving determinations. On the other hand, the JCT and NEC conditions did not specify the capacity, under which the engineering professionals shall act when exercising these roles. As for the other roles, numbered four to nine in Figure 6, the engineering professionals are appointed to any one of these roles upon the mutual agreement of both parties to the contract, i.e., the owner and contractor. For this reason, professionals acting under these roles are considered to be fully independent and shall be required to act impartially when giving any judgement, be it at the level of rendering an opinion (allowed to be mutually requested in the case

of having a full-term DAB in place) and up to the level of issuing an arbitration proceedings award.

As for the deduced judgement properties, the analysis revealed two main patterns. Under the first one, the first-rendered judgement is born binding, but it can possibly become final after invoking an alternative dispute resolution mechanism (ADR). Under the other one, that same judgement is born binding and final, but its “final” property can be revoked by invoking an ADR mechanism.

4. Judgement-Rendering Guiding Principles

It has been established through the above-offered analysis that engineering professionals can be requested to assume different roles in connection with the administration of claims and disputes either on behalf of owners or under appointments mutually agreed on by both the owner and contractor concerned with the disputed matter. The analysis revealed that such roles carry two primary characterizations related to the extent to which the independency and impartiality role capacities are expected to overshadow the rendering of judgements. Here, an intuitive concern is raised as to whether the concerned engineering professionals are expected to conduct themselves differently under the above-inferred spectrum of roles. To this end, it can be argued that, regardless of the role and its inherent independency and impartiality capacities, the rendering of judgements, concerned primarily with whether a contractor’s eligibility for and amounts of entitlements can be justified, shall be guided by a number of other (and

in many aspects related) governing principles of conduct. Four main principles, as shown in Figure 84, have as such been identified: (1) objectivity, (2) professionalism, (3) due diligence, and (4) standard of care. The Law Dictionary defines objectivity as “an unbiased attitude or opinion that is based on actual evidence”, a meaning that can be viewed to be closely related to what impartiality also entails.

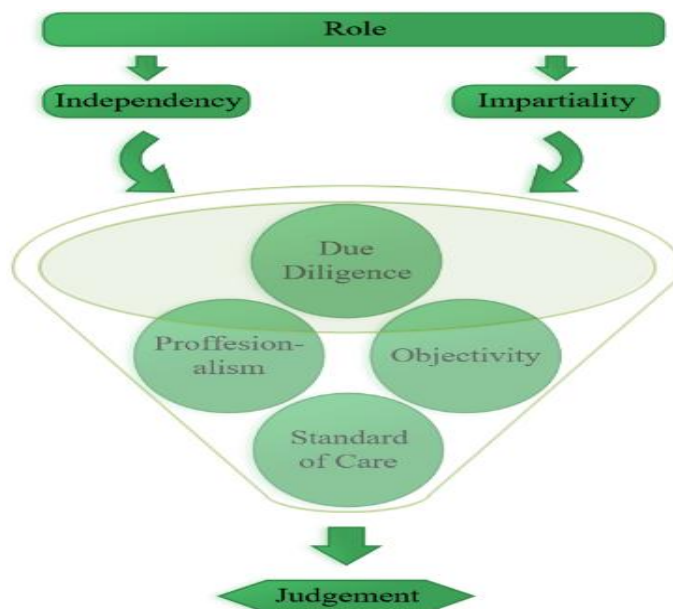


Figure 84. Judgement's Rendering Buffer

In other words, judgements cannot be based on or influenced by personal feelings; rather, facts and evidentiary material must be taken into consideration when rendering any judgement. In addition, an engineering professional is definitely required to act with professionalism. In this regard, the FIDIC requirements call on the

“Engineer” to carry out his determination-rendering duty in a professional manner, utilizing his “suitably qualified engineers and other professionals” (FIDIC 2000).

CHAPTER VII

SIMULATION MODELING

A. Preamble

Claims have become almost inevitable through the course of construction projects. As a matter of fact, the construction contract conditions play a critical role as to the administration and resolution of claims and disputes. As such, owners and contractors are urged to adopt effective claim/dispute mechanisms with the aim of resolving arising conflicts. In practice, relevant such mechanisms are those stipulated under the standard conditions, namely those offered by the AIA, the ConsensusDocs, the EJCDC, the FIDIC, the JCT, and the JCT. As shown in previous chapters, the standardized claim/dispute resolution mechanisms differ in (1) the adopted phases, (2) the sequencing of the phases, and (3) the operations of the phases. Henceforth, different mechanisms lead to different outcomes, that could either ease or hinder the resolution process of claims/disputes.

In order to conduct an objective comparison, the operational variations of the examined mechanisms shall be the only factors affecting the progression of claims/disputes. As such, the examined mechanisms shall be operated in environments that impose similar conditions. In practice, the spectrum of mechanisms shall be adopted within the same construction project to deal with the arising conflicts, which

make it impossible to happen. For this reason, Axelrod (2006) stated that simulation could be used whenever it is difficult/impossible to experiment with a real system. In fact, simulation is a technique that builds a virtual system mimicking a real one, which allows parties to conduct experiments to understand the behavior of the system (Shannon 1998).

B. The best-suited Simulation Technique

Three simulation techniques could prove promising in simulating the claims/disputes resolution processes, namely: (1) discrete-event simulation (DES), (2) system dynamics (SD), and (3) agent-based modeling (ABM) (Maidstone 2012). Although several studies compared the applicability of these methods in various fields (Brailsford and Hilton 2001, Tako and Robinson 2009, Tako and Robinson 2009, Siebers et al. 2010, Maidstone 2012), and some have adopted these tools in dispute resolution (El-Adaway and Kandil 2009, Menassa and Peña Mora 2010), none has evaluated their feasibility in modeling the progression of claims in particular. Therefore, this section aims at evaluating these three techniques in modeling the progression of claims and identifying the most suitable one. To avoid the evaluation of a specific standardized mechanism, a generic timeline was adopted. As such, the adopted methodology involves: (1) defining the generic claim/dispute timeline, (2) creating DES, SD, and ABM models to simulate the progression of claims along the timeline, and (3) evaluating the applicability of every simulation method in replicating real-life scenarios.

1. Claim/Dispute Timeline

Claims arising within construction projects are addressed according to the mechanism set forth in the claim/dispute administration and resolution provisions. Based on relevant standard conditions currently in use, the mechanism typically consists of three main modules: (1) the disclosure of claim, (2) the judgment(s), and (3) the final resolution of dispute, as shown in Figure 85.

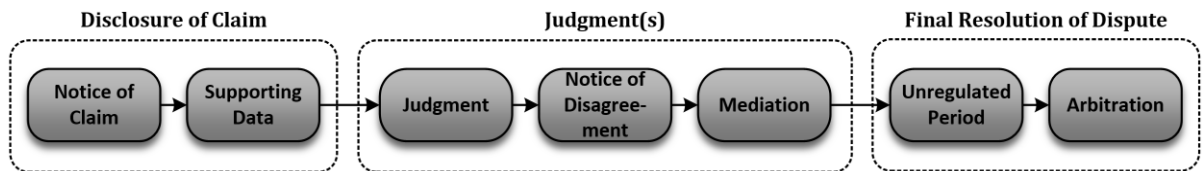


Figure 85. Claim Timeline

Starting with the disclosure of claim module, the claimant has to submit a notice of claim (NoC) to the other party to notify him of the arising issue. In addition, the claimant has to provide supporting data (SD) to justify the eligibility and/or quantum of the claim. In this study, it was assumed that the time-bars of these two stages are sequential whereby the time-bar of the supporting data stage is not activated unless and until the notice of claim is submitted. However, upon submitting the supporting data, the claim moves to the next module whereby an engineering professional shall act impartially to render a judgment. The rendered judgment is binding upon both parties with the possibility of turning final if not revoked within a specified period. In this

case, either party shall submit a notice of disagreement (NoD) in order to revoke the judgment and initiate mediation. If the mediation process is not initiated, then the judgment becomes final and both parties waive their rights in pursuing mediation or arbitration. It is worth mentioning that this judgment acts as a condition precedent to mediation unless it was not issued in the first place within a specified period, allowing thereby either party to unilaterally initiate mediation at any time. When mediation is pursued, both parties shall endeavor to reach an agreement. If the mediation is deemed unsuccessful, the mediator can conclude the mediation at any time. Moreover, either party may terminate the process after a specified period. The end of the mediation process signals the start of the final resolution of dispute module. Within this module, either party can refer the matter in dispute to arbitration at any time, thereby dragging the claim within an unregulated period, as shown in Figure 85.

2. Simulation Techniques

The following subsections model the claim mechanism using each of the DES, SD, and ABM simulation paradigms within the anylogic environment (Borshchev and Filippov 2004).

a. Discrete-Event Simulation

DES is one of the most popular simulation techniques used to model a process (Maidstone 2012). This technique adopts the top-down modeling approach whereby it

focuses on modeling in detail a system and not entities. Furthermore, the entities flowing through the process are passive and they cannot act independently since their behavior is affected by that of the system. Figure 86 depicts the anylogic model simulating the progression of claims using DES.

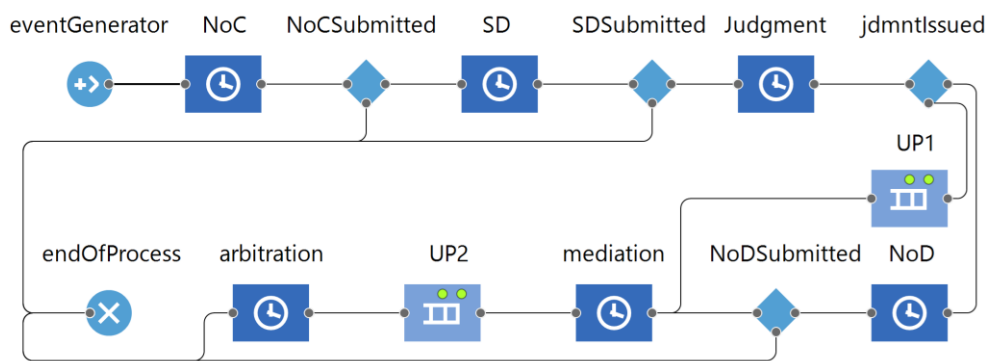


Figure 86. Simulating Claim/Dispute Timeline using DES

The model starting point is the source “eventGenerator” that generates the entities into the system. These entities are the events that give rise to a claim. All states within the claim/dispute timeline were modeled as tasks (i.e. dark blue rectangular shapes) except for the two instances of unregulated period. Once an entity flows into a task, an action is taken. For illustration, the event triggers the claimant to submit a notice of claim upon entering the “NoC” task. Upon exiting the “NoC” task, the claim entity is faced with two options through a “NoCSubmitted” select-output (i.e. diamond shape). In this case, if a notice of claim is not submitted within the specified period, the process ends, thereby shifting the claim entity to the “endOfProcess” sink where it

leaves the system; otherwise, the claim entity moves to the supporting data stage (i.e. “SD” task). The claim entity proceeds through the claim/dispute timeline as explained in Section 3 and can possibly face two instances of unregulated periods (UP), modeled as queues in Figure 24. The first occurs when a judgment is not rendered within the stipulated time, then allowing contractual parties to initiate mediation at any time. This moves the claim entity through the “UP” queue to reach the “mediation” task. On the other hand, the second occurs when either party may refer the dispute to arbitration at any time. In this case, the claim entity stays in the second “UP” queue for an unregulated period of time before it moves to the “arbitration” task.

b. System Dynamics

SD is another popular simulation technique used to model a system. Figure 87 shows the SD model of the claim/dispute mechanism. Similar to DES, a top-down modeling approach is adopted, but the system is modeled as a series of tanks or stocks (i.e. rectangular shapes) connected by pipes or flows (i.e. arrows), and entities are viewed as a continuous quantity flowing through this system. The rates of flow are controlled by valves, and accordingly the time spent in each stock or system state is modelled by fixing the rates of inflow and outflow (Brailsford and Hilton 2001).

In this case, the stages of the claim/dispute mechanism were modeled as the stocks, and the transitions between the stages were modeled as flows. Within the SD model, the claim entities flow from one stock to the other based on the flow rates set

through direct and indirect variables. This approach allows modelers and practitioners to identify causal loops that show the impact of the system’s variables on the flow of entities.

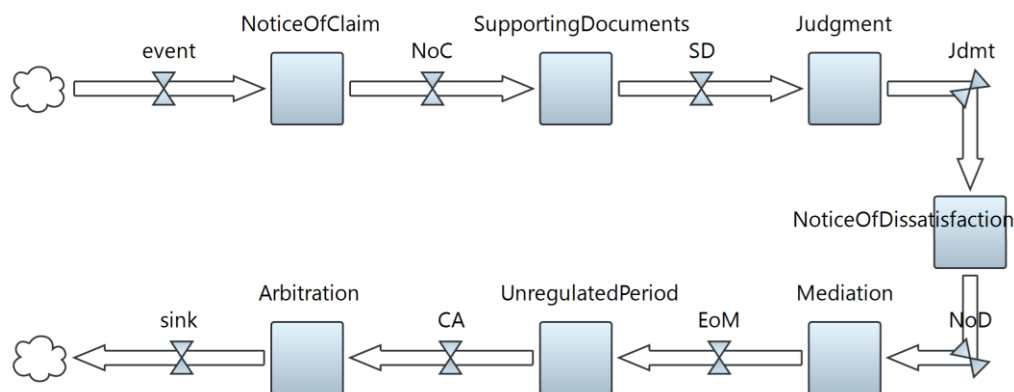


Figure 87. Simulating Claim/Dispute Timeline using SD

c. Agent-Based Modeling

Unlike DES and SD, ABM adopts the bottom-up modeling approach and aims at mainly modeling agents and the interactions among them (Maidstone 2012), and while focusing on both passive and active entities. This technique relies on state-charts to model the different agent states. For illustration, Figure 88 shows the state-chart of the claim agent, in particular.

The various stages within the claim/dispute timeline were modeled as states that are connected using different types of transitions. For illustration, the claim agent transitions from the “noticeOfClaim” state to the “supportingDocuments” state upon receiving a message from the claimant agent indicating that the notice was submitted.

On the other hand, the “noticeOfClaim” state is connected to the “endOfProcess” state using a time transition and not a message transition. In this case, if the time transition stipulated period expires prior to receiving the message of submitting the notice, the claim moves automatically to the “endOfProcess” state.

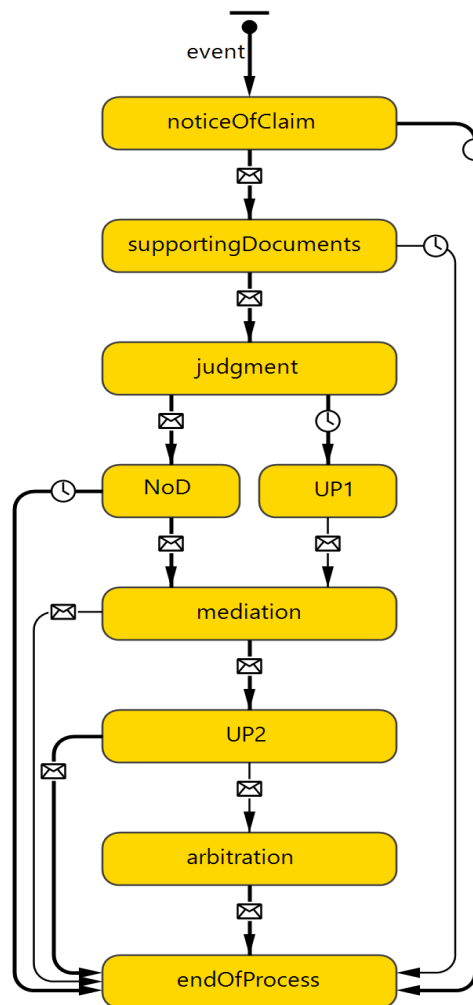


Figure 88. Simulating Claim/Dispute Timeline using ABM

It is worth mentioning that other active agents such as the contracting and other involved parties (i.e. owner, contractor, judgment engineering professional, mediator, etc.) are part of the ABM model, and their interactions throughout the claim/dispute timeline contribute greatly to the overall emerging system behavior.

3. Discussion

In this section, the choose-by-advantage decision making tool was used to determine the most suitable simulation method for modeling the progression of claims (Table 20). Starting with the nature of the problem, the claim/dispute mechanism is a process that has a queueing network. As such, the DES method fits in that regard and is highly applicable in modeling the progression of claims. However, the ABM method is considered moderately applicable (Siebers et al. 2010) since the mechanism is modeled as a state-chart of the claim agent. The SD technique is considered the least applicable as the aim behind modeling the progression of claims consists of focusing on the entities rather than on the system (Tako and Robinson 2009).

On the other hand, comparing method's goals to that of the modeled problem reveals different results (Table 20). In this case, the DES goals are considered to be more similar to the problem's goals than the SD goals. However, the ABM goals are considered to be the most similar ones because this technique examines the behavior of the system that cannot be predicted automatically and emerges from the various agents' interactions (Klügl and Bazzan 2012).

Table 20. Choose-by-Advantage of the Three Simulation Techniques

Factors	DES		SD		ABM	
Nature of Problem (Applicability)	Process-Oriented Highly Applicable	85	System-Oriented Least Applicable	0	Individual-Based Moderately Applicable	60
Method's Goals vs. Problem's Goals (Similarity)	Comparison of Scenarios, predictions, and/or optimization More Similar	45	Understanding feedback dynamics and long-term system behavior Less Similar	0	Examining the system behavior that emerges from the interactions of agents Most Similar	100
Modeling (Ease)	1) Stochastic 2) Tasks and queues 3) Transition to the next stage is time-based Difficult	20	1) Deterministic 2) Stocks and flows 3) Transition to the next stock depends on flow rates Most Difficult	0	1) Stochastic 2) Agents and States 3) Transitions to the next state are time-based and/or action-based Moderate	70
Total		150		0		230

Moving to the ease of modeling, SD is considered the most difficult one as models tend to be deterministic, stages are modeled as stocks and the flow rate between the stocks cannot be easily evaluated. In the case of DES, modeling is considered difficult as the progression of claims is modeled in a stochastic fashion due to the variability of time needed to take the corresponding action at each stage. Furthermore, the transitions between the stages are mainly time-dependent and not action-based moving the claim entity to the next stage upon an action being taken by the concerned party. It can be argued that the time needed for an action to be taken can be modeled as the time needed for the claim entity to move to the next task, which is not easy to model. Similar to DES, ABM models are stochastic in nature (Maidstone 2012), but the transitions between the states are not only time-based but also action-based whereby a claim moves to the next state based on a taken action, which facilitates modeling the

problem at hand. As such, the ease of modeling level of the ABM method is considerate moderate. Consequently, the points assigned to each factor, based on their corresponding advantage, showed that the ABM approach is the most suitable one to model the progression of claims with a total of 230 points.

C. Simulation Modeling

Based on the recommendations of the preceding section, agent-based modeling was the technique used to model the standardized claims/disputes resolution mechanisms. In fact, the ABM model represents the project's environment, that includes four main agents: (1) the owner, (2) the contractor, (3) the engineering professional, and (4) the claim. To simplify the modeling process in the ABM simulation, only the characteristics of the real system that affected directly the progression of claims/disputes were considered. As such, the simulation model ends up being less complex than the real system.

1. Methodology

The contracting parties have the option to adopt any set of conditions for a construction project. To choose the most suitable one, the parties should be able to assess the effectiveness of each set of conditions. As such, this section implements the ABM simulation technique to study the effectiveness of the underlying claims/dispute resolution mechanisms, that are stipulated under 6 sets of standard conditions.

The adopted methodology involved (1) developing the conceptual models of the real system, (2) formulating the rules to be used in the ABM models, (3) building the ABM simulation models, and (4) verifying and validating the simulation models. The findings of this section are presented through an in-depth analysis of the outputs, namely (1) average time to have a binding judgment, (2) percentages of claims/disputes resolved upon reaching agreement, (3) average time to reach agreement, (4) percentages of claims/disputes ending-up in an unregulated period, and (5) percentages of claims/disputes referred to arbitration.

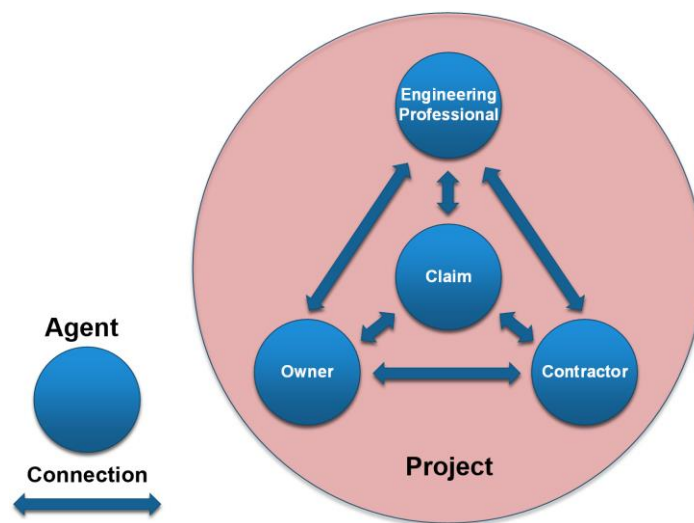


Figure 89. ABM Model Setup

2. Conceptual Models

Conceptual models are used to conceptualize the real system, prior to being implemented in the simulation software. Under the ABM simulation technique, any

relevant entity could be modeled as an agent, where its behavior is demonstrated in a statechart that shows the different states the agent could be at. As mentioned earlier, the agents considered are (1) the owner, (2) the contractor, (3) the engineering professional, and (4) the claim. For the first three agents, it was considered that the agent could either be idle or working. As for the claim agent, its statechart illustrates the different phases of the resolution mechanism. As such, the conceptual model of the latter shall illustrate the underlying mechanisms stipulated under each set of standard conditions. To this end, the flowcharts developed earlier endorse all possible scenarios that could evolve under any set of standard conditions. Therefore, it can be argued that the process flowcharts can be viewed as the conceptual models of the claims and disputes resolution mechanisms.

3. Simulation Rules

To build an ABM model, the conceptual model shall be implemented through a statechart. A statechart is composed of states and transitions, where transitions link states and regulate the movement of the agents in-between the states. As a matter of fact, the states resemble the phases under each mechanism, and the transitions resemble the rules upon which the claim/dispute moves to the next phase. Among the various types of transitions available, the ones used for modeling the claims/disputes resolution mechanisms were either a “timeout” transition or a “message” transition. In several situations, the claim/dispute moves to the next phase upon the expiry of the relevant

time-bar. Accordingly, timeout transitions were used, where the agent moves to the next state upon staying in the current state for a predetermined period of time. The durations of the timeout transitions were defined based on the time-bars stipulated under the pertinent conditions. In other cases, the claim/dispute proceeds to the next phase upon an action being taken by one or multiple parties, be it the owner, the contractor, the judgment-rendering party, or the mediator. To this end, it can be argued that actions taken by any party can be modeled as messages sent to the agent that gives it the permission to move to the next phase. As such, message transitions were used to model these cases. The following sub-sections present the rules used for each phase. It is worth noting that the same simulation rules were used for the same phases across all claim/dispute resolution mechanisms.

a. Disclosure of Claims

Within the disclosure of claims phase, the process of issuing a notice of claim and submitting particulars shall be modeled. However, if the claimant fails to issue a notice of claim within the allotted time, the claim/dispute resolution mechanism will not be triggered. As such, there are no interests in modeling such scenarios. For this reason, it was assumed that the notice of claim has been already issued, where the model starts at the event of submitting supporting particulars.

It was assumed that upon having a notice of claim in place, the claimant has studied the matter meticulously and found that the claim is worth pursuing.

Consequently, it would be inappropriate to not submit the supporting particulars on time. As such, it was assumed that the percentage of successfully furnishing the supporting documents is 85%, based on the assumption that the claimant has not submitted the notice of claim arbitrarily.

b. Judgments

This section discusses the modeling process of rendering judgments by the engineering professionals. It could either be an initial judgment or a decision rendered within the initial judgment phase or the adjudication phase, respectively. Under both cases, it is assumed that the engineering professional is exercising due diligence when acting under these roles. In fact, it is stipulated under the “Obligations of the Consultant”, under the “Client/Consultant Model Services Agreement”, that “the Consultant shall exercise reasonable skill, care and diligence in the performance of his obligations under the Agreement” (FIDIC 1998). Besides, it is explicitly clarified under the “Architect’s Responsibilities”, under the “Standard Form of Agreement Between Owner and Architect”, that “the Architect shall perform its services as expeditiously as is consistent with such professional skill and care and the orderly progress of the Project” (AIA B101 2017). As such, it can be assumed that the engineering professionals acting under the judgment rendering roles are not mediocre engineers. For this reason, it was assumed that a competent engineering professional would not be in error when acting for more

than 15% of the times. As such, the percentage of successfully rendering a judgment was assumed to be 85%.

c. Consultations and Discussions

The claims/disputes resolution mechanisms stipulated under the ConsensusDocs, the EJCDC, and the FIDIC conditions adopt a consultation/discussion phase. Under this phase the contracting parties are given the chance to initiate negotiations in an endeavor to reaching agreement. To this end, Cheung et al. (2010) designed a logistic regression (LR) model to categorize projects as having either adverse or favorable project dispute resolution satisfaction (DRS). A project DRS is classified as favorable if disputes are resolved through negotiation. On the other hand, if disputes are resolved through ADR processes, arbitration or litigation, the project DRS is classified as adverse. The LR prediction model of project DRS is presented in Equation 1.

P1 is the probability of having an adverse project DRS. The significant factors used in the model are: (1) E_TENIN: the change in the tender price, (2) P_DESCH: degree of design changes, (3) R_INC_CL: incentive for client to settle, and (4) R_MAN_CL: degree of involvement of senior management in the dispute resolution process. The values of the significant factors are illustrated in Table 21 (Cheung et al. 2010).

Equation 1. Negotiation LR Prediction Model (Cheung et al. 2010)

$$\ln\left(\frac{P_1}{1 - P_1}\right) = - 10.853 - 0.445(E_TENIN) + 28.156(P_DESCH) \\ + 0.906(R_INC_CL) + 1.484(R_MAN_CL)$$

Based on the LR prediction model, 1-P1 is the probability of having a favorable project DRS. Within the simulation models, random values of the significant factors were assumed to calculate the probability of resolving claims through negotiations (1-P1).

Table 21. Negotiation Significant Factors' Values

Significant Factor	Value
E_TENIN	Normal Distribution (Mean = 5.137, Standard Deviation = 3.911)
P_DESCH	Normal Distribution (Mean = 0.113, Standard Deviation = 0.072)
R_INC_CL	Likert scale of 1–6 (high-low)
R_MAN_CL	Likert scale of 1–6 (high-low)

d. Mediation

Under any set of standard conditions, agreement could be reached through mediation. However, if the mediation process was deemed unsuccessful, the process ends upon

being terminated by either contracting party or concluded by the mediator. As such, to model the mediation process, there is a need to know the percentage of reaching agreement and that of ending the mediation process. In this regard, Yiu et al. (2006) developed LR prediction models that could predict the probability of reaching a win-win settlement and that of progress, as shown in equations 2 and 3 respectively.

Equation 2. Reaching Agreement LR Prediction Model (Yiu et al. 2006)

$$O_{\text{win-win settlement}} = - 2.084 + 1.215 T_{\text{ice breaking}}$$

The above model predicts the probability of reaching a win-win settlement through mediation. The independent variable “ $T_{\text{ice breaking}}$ ” shows the degree of usefulness of the “ice breaking” mediator’s tactics. It is the only mediator’s tactic that showed significant correlation between with the predicted mediation’s outcome. The mediator’s tactics was rated on a scale 1 to 5, where 1 is being least useful and 5 being most useful. When running the simulation models, random values of the mediator tactic were chosen to calculate the probability of reaching agreement.

Equation 3 is used to predict the probability of achieving progress through the mediation process. It was shown that the “trust building” and “process control” tactics were the only ones correlated with the progress outcome of mediation. Both tactics were rated on a scale 1 to 5, where 1 is being least useful and 5 being most useful. Within the simulation model, the probability achieving progress was calculating upon assuming

random values of the relevant tactics. It was assumed that if progress was not achieved, then mediation process ends.

Equation 3. Ending Mediation LR Prediction Model (Yiu et al. 2006)

$$O_{\text{progress}} = - 7.358 + 1.277 T_{\text{trust building}} + 1.368 T_{\text{process control}}$$

e. Amicable Settlement

Amicable settlement is adopted by the FIDIC conditions only, where the contracting parties shall endeavor to reaching agreement through initiating negotiations or adopting any ADR technique. Beside negotiation, Cheung et al. (2010) developed a LR prediction model to predict the probability of resolving disputes either through negotiation or ADR. The corresponding LR model is shown under Equation 4.

Equation 4. Amicable Settlement LR Prediction Model (Cheung et al. 2010)

$$\ln\left(\frac{P_2}{1 - P_2}\right) = - 11.796 - 0.809(E_TENIN) \\ + 0.246(O_C_CLAM) + 43.892(P_DESCH) \\ + 2.120(R_NEG_CL)$$

P_2 is the probability of having an adverse project DRS. However, under this LR model, a project is said to have an adverse project DRS if disputes were resolved either

through arbitration or litigation. As such, $1 - P_2$ is the probability of a project having a favorable project DRS, that is the probability of disputes being resolved either through negotiation or ADR. As such, $1 - P_2$ is the probability of disputes being resolved through amicable settlement. The significant factors used in the model are: (1) E_TENIN: the change in the tender price, (2) O_C_CLAM: claim consciousness of contractor, (3) P_DESCH: degree of design changes, and (4) R_NEG_CL: negotiation skill of the dispute resolution team of the client. The values of the significant factors are illustrated in Table 22 (Cheung et al. 2010).

Table 22. Amicable Settlement Significant Factors' Values

Significant Factor	Value
E_TENIN	Normal Distribution (Mean = 5.137, Standard Deviation = 3.911)
O_C_CLAM	number of claim notifications/number of variations instructions
P_DESCH	Normal Distribution (Mean = 0.113, Standard Deviation = 0.072)
R_NEG_CL	Likert scale of 1–6 (high-low)

f. Other Rules

To have a complete list of simulation rules, those related to the satisfaction of either party with a rendered judgment shall be defined. Under any mechanism, either party could have to issue a notice of dissatisfaction with a rendered judgment. In this regard, there are endless possibility that could occur, where it is difficult to detect the

satisfaction of the corresponding parties. Consequently, the probability of issuing a notice of satisfaction with any judgment was considered to be totally random.

When submitting supporting data or rendering judgments, the corresponding party shall act within a predetermined period of time. Consequently, it is not only enough to know the percentage of successfully acting, but also there is a need to know when the action was taken. To this end, research studies, by Karau and Kelly (1992) and Lim and Murnighan (1994), found that individuals are likely to increase their productivity just before the arrival of deadlines in order to complete tasks on time. Henceforth, it was assumed that parties are likely to act towards the deadline. As such, the time, at which a party acts, was assumed to be a triangular distribution having a minimum duration of 1 week, a maximum duration of the stipulated deadline, and a mode of 1 week earlier than the deadline. This rule was applied to all time-related cases.

4. Model Verification and Validation

The simulation models, presented in the following section, shall be verified and validated. To verify the models, the following question shall be answered: “Did we build the model right?” (Law 2014). To this end, the computer model underwent several procedures as specified by Bennett et al. (2013), namely (1) assessing the model’s aim and scope, (2) checking the data, (3) conducting a visual performance analysis, (4) selecting the basic performance criteria (outcome and duration), and (5) introducing

refinements to the simulation model to assure that the model fulfill the intended objectives.

On the other hand, validation is the process of checking if the right model was built (Law 2014). Regarding this concern, Sargent (2011) developed several validation techniques. The ones applied to this research study were (1) philosophy of science method, (2) structured walkthrough, (3) trace, and (4) parameter variability. One of the philosophies of science methods that needs to be satisfied is rationalism, that requires the simulation model to be logically developed based on a set of clearly stated assumptions. In fact, the simulation models represent claims/dispute resolution mechanisms that are explicitly stipulated under the sets of standard conditions. After developing the simulation models, a structured walkthrough validation was applied to determine the models' correctness upon presenting it to a peer group. Afterwards, the trace validation was conducted upon tracing the progression of claims through the model. As such, it was possible to test the model's logic and to check if necessary accuracy was obtained. Finally, a parameter variability validation was performed, where the values of the input and internal parameters were changed to determine its effect on the model's output. In this regard, several scenarios of know inputs and outputs were implemented to compare if the effect of the changed parameters is similar to that in the real system.

5. ABM Model

There were 6 simulation models that were developed to model the claims/dispute resolution mechanisms stipulated under the AIA, the ConsensusDocs, the EJCDC, the FIDIC, the JCT, and the NEC conditions. AnyLogic 8 (Personal Learning Edition) was used as the simulation platform to build the ABM models and establish the research objectives.

a. Main Environment

The main environment of the ABM model is presented in Figure 90. This environment denotes the project's settings, where the group of relevant agents are defined. This includes the owner, the contractor, the engineering professional, and the claims.

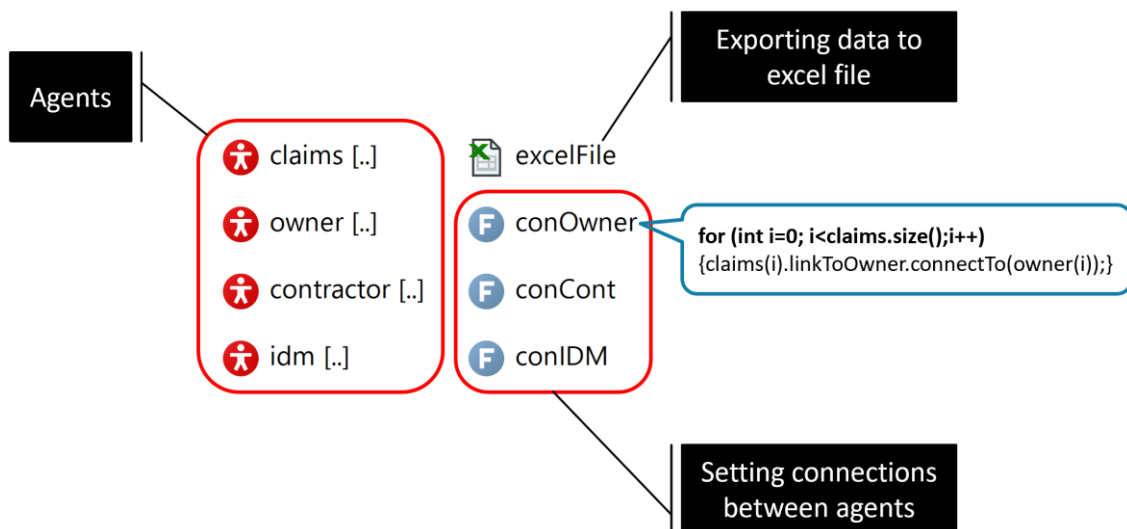


Figure 90. Main Environment

Besides, functions were developed to set the connections between agents. It was considered that each claim agent is linked to an owner, a contractor, and an engineering professional. The results of the thousand iterations were logged in an excel file to be analyzed later on.

b. The Owner's, The Contractor's, and The Engineering Professional's Environment

The environment of all parties involved in the project is similar to the one presented in Figure 91. The statechart formulated shows that the agent can be at 2 different states, idle and working. Upon receiving a message from the claim agent, the agent moves from the idle state to the working state to take a specific action. Using the corresponding engine, the party takes an action and moves back to the idle state. Afterward, the action is sent back to the claim agent.

c. The AIA Simulation Model

The flowchart of the AIA's claim/dispute resolution mechanism, illustrated in Figure 13, was modeled as an ABM model, as shown in Figure 92. As clarified earlier, the issuance of the notice of claim was not modeled, where the simulation model starts at the event of rendering a decision. If a decision was rendered within 30 days, the claim moves from the "Decision" state to the "DFMorFM" state, where either party could either file for mediation or demand the other party to file for mediation. Otherwise, the

claim moves to the “UnregulatedFM” state upon the expiry of the 30 day-period, where either party could file for mediation at any time.

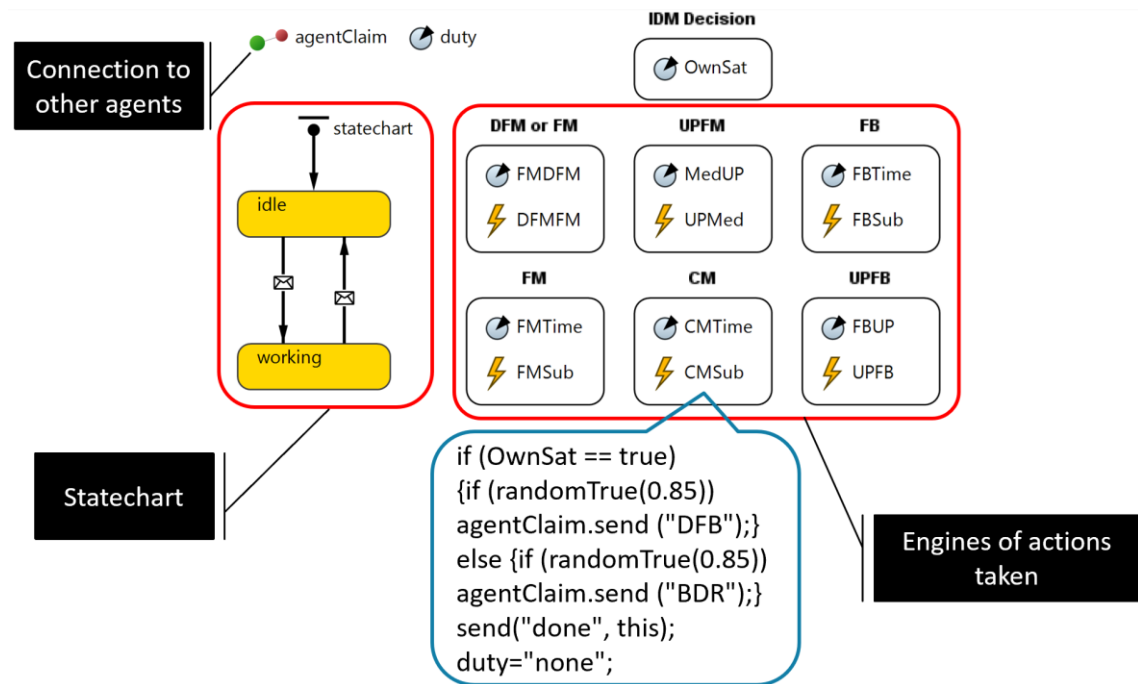


Figure 91. Project Parties' Environment

Within the “UnregulatedFM” state, it was assumed that claims remaining there for more than 30 days were considered suspended and resumed later on as a global claim. As such, claims move from the “UnregulatedFM” state to the “GC” state upon the expiry of the 30 day-period. On the other hand, if either party demands the other party to file for mediation, the claim moves from the “DFMorFM” state to the “FM” state, where the demanded party shall file for mediation within 30 days.

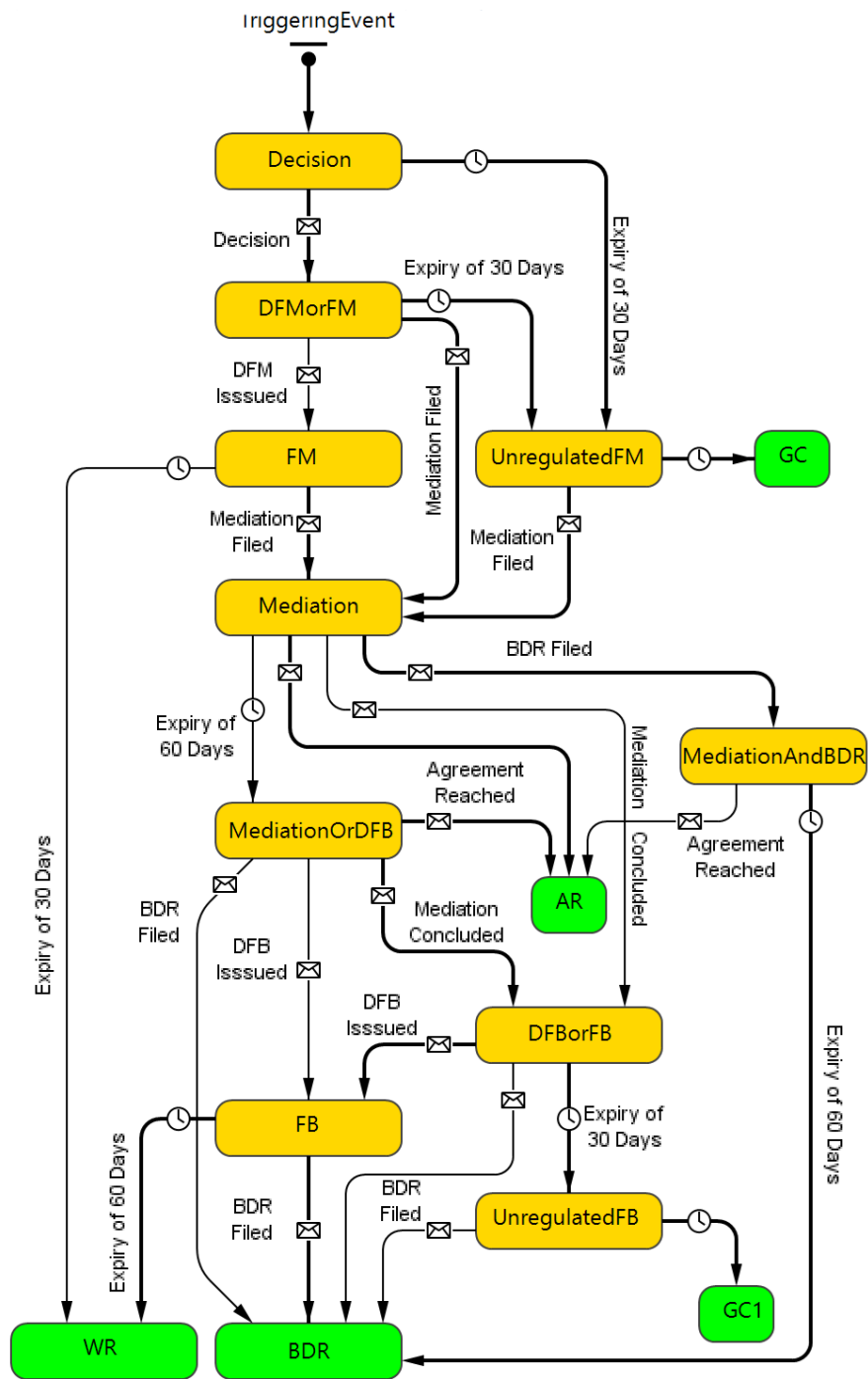


Figure 92. AIA Claim Agent Statechart

If the relevant time-bar expires with mediation not being filed, the claim moves to the “WR” state, where both parties waive their rights in pursuing mediation or binding dispute resolution. Once mediation is filed, the claim moves from the “DFMorFM” state, the “FM” state, or the “UnregulatedFM” state to the “Mediation” state. Within a period of 60 days, reaching agreement, concluding mediation, or filing for binding dispute resolution shifts the claim to the “AR” state, the “DFBorFB” state, or the “MediationAndBDR” state, respectively. If the 60 day-period expires while the claim is at the “Mediation” state, then the claim automatically moves to the “MediationOrDFB” state. Within that state, the claim moves to the “DFBorFB” state, the “FB” state, or the “BDR” state upon concluding mediation, demanding the other party to file for binding dispute resolution, or filing for binding dispute resolution, respectively. Within the “MediationAndBDR” state, the claim could either move to “AR” state upon reaching agreement or to “BDR” state upon the expiry of the mediation’s original 60-day period. on the other hand, claims within the “DFBorFB” state moves to the “FB” state, “BDR” state, or the “UnregulatedFB” state upon demanding the other party to file for binding dispute resolution, filing for binding dispute resolution, or the expiry of the 30 day-period. Once a claim reaches the “FB” state, it could end-up in the “BDR” state or in the “WR” state depending on whether or not dispute binding resolution was filed for within the period of 60 days, respectively. Similar to “UnregulatedFM” state, claims within the “UnregulatedFB” state moves to

the “GC1” state if neither party filed for binding dispute resolution within 30 days. Otherwise, the claim moves to the “BDR” state.

d. The ConsensusDocs Simulation Model

The ABM model of the ConsensusDocs’s claims/dispute resolution mechanism, presented in Figure 93, was developed based on the flowchart presented in Figure 22. The model starts at the “SD” state, where the claim moves to the “Response” state upon the submission of the supporting documents. Afterward, if the claim was approved, it moves to the “Approved” state. On the other hand, the claim moves to the “Discussions” state if it was denied or if the allotted time-bar expires with no response rendered. Within the “Discussions” state, both parties shall mutually agree to initiate mediation. The failure to do so within 30 days shifts the claim to the “GC” state. Upon the initiating of discussions, the claim moves to the “FD” state, where reaching agreement through discussions shifts the claim to the “Agreement” state. If no agreement could be reached or the allocated time-bar expires with no agreement reached, the claim moves either to mediation or mitigation, randomly. Within the “Mediation” state, the claim could only move to the “MedConvened” state either upon the mutual agreement to initiate mediation or the expiry of the 30 day-period. Afterward, the claim moves to the “Agreement” state if agreement was reached through mediation. On the other hand, if the mediation process was concluded or the allotted time-period expired, the claim moves to the “EndOfMed” state. Besides, the claim

could move to the “Terminated” state if mediation was terminated by either party. Under “EndOfMed” and “Terminated” state, the claim moves spontaneously to the “UP” period, where parties could file for binding dispute resolution at any time.

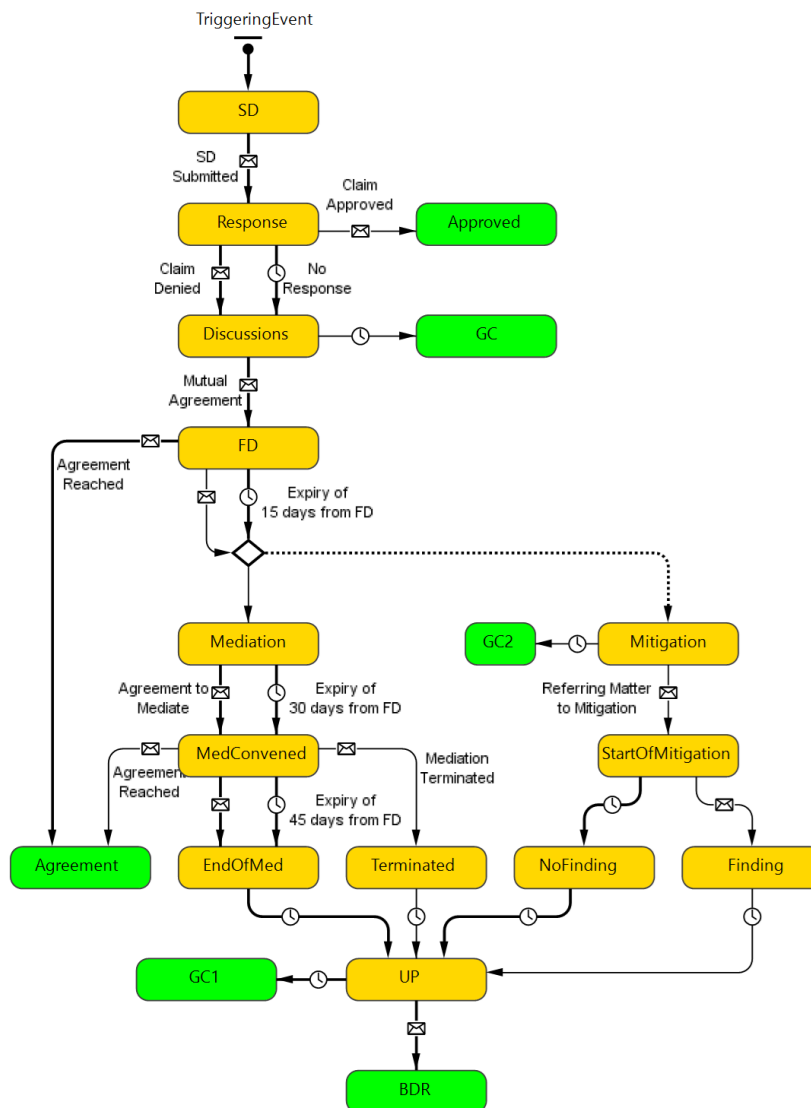


Figure 93. ConsensusDocs Claim Agent Statechart

On the other hand, a claim within the “Mitigation” state would end-up in the “GC2” state if claim was not referred to mitigation. Upon referral, the claim moves to the “StartOfMitigation”, where a finding could be rendered. As such, the claim moves to the “Finding” state. Otherwise, the claim moves to the “NoFinding” state. Under both states, the claim moves spontaneously to the “UP” state. Within the “UP” state, the claim moves to the “GC1” state if neither party files for binding dispute resolution within a period of 30 days.

e. The EJCDC Simulation Model

Based on the flowchart presented in Figure 29, the ABM model, illustrated in Figure 94, was developed. The model starts at the “RevRes” state, that is the review and resolution stage. Within this state, the claim could move to the “Mediation” state, the “InvokeFRD” state, or the “UP” state upon initiating mediation, rendering an action, or the expiry of the corresponding time-bar, respectively. Within the “Mediation” state, reaching agreement shifts the claim to the “AR” state. On the other the claim can be shifted to the “CM” state upon concluding mediation. If neither scenario occurs, then the claim moves to the “MediationOrTerm” state. Within this state, the same options of the previous ones exist beside shifting the claim to the “TM” state upon terminating mediation. If a claim was at the “CM” or the “TM” state, it has to be checked if the time-bar of the review and resolution phase expired. If yes, the claim moves spontaneously to the “UP” state. Otherwise, the claim moves to the “ResRev” state.

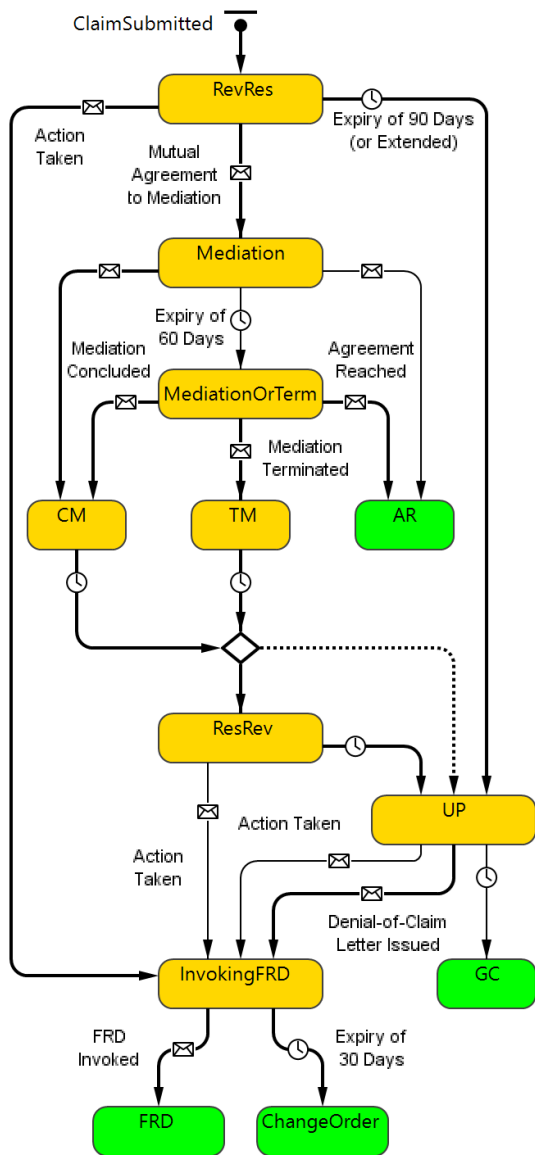


Figure 94. EJCDC Claim Agent Statechart

Within this state, the claim moves to the “UP” state if it did not move to the “InvokingFRD” state within the allotted period. Under the “UP” state, several options exist. The claim moves to the “InvokingFRD” state if the owner rendered an action or

either party issued a denial-of-claim letter. The failure to do either options, within a period of 30 days, shifts the claims to the “GC” state. On the other hand, the claim moves from the “InvokingFRD” state to the “ChangeOrder” state if final resolution of dispute was not filed for with a period of 30 days.

f. The FIDIC Simulation Model

The ABM model of the claims/disputes resolution mechanism set forth under the FIDIC conditions starts at the “EIR” state, that is the engineer’s initial response. After issuing a notice of claim, the engineer can check whether or not the contractor issued the notice of claim within the allocated time. If not, the engineer can issue an initial reply. Otherwise, the engineer is not supposed to act. In either case, the claim moves to the “FDC” state, where the contractor needs to submit fully detailed claim. If the fully detailed claim was not submitted on time, the claim automatically moves to the “NoCLB” state. Otherwise, the claim moves either to the “Agmnt” state or to the “CLB1” state depending on whether or not the contractual legal and/or other bases were submitted, respectively. However, if the claim ends-up in the “CLB1” state, it can move again to the “Agmnt” state upon submitting the contractual legal and/or other bases within the time allowed.

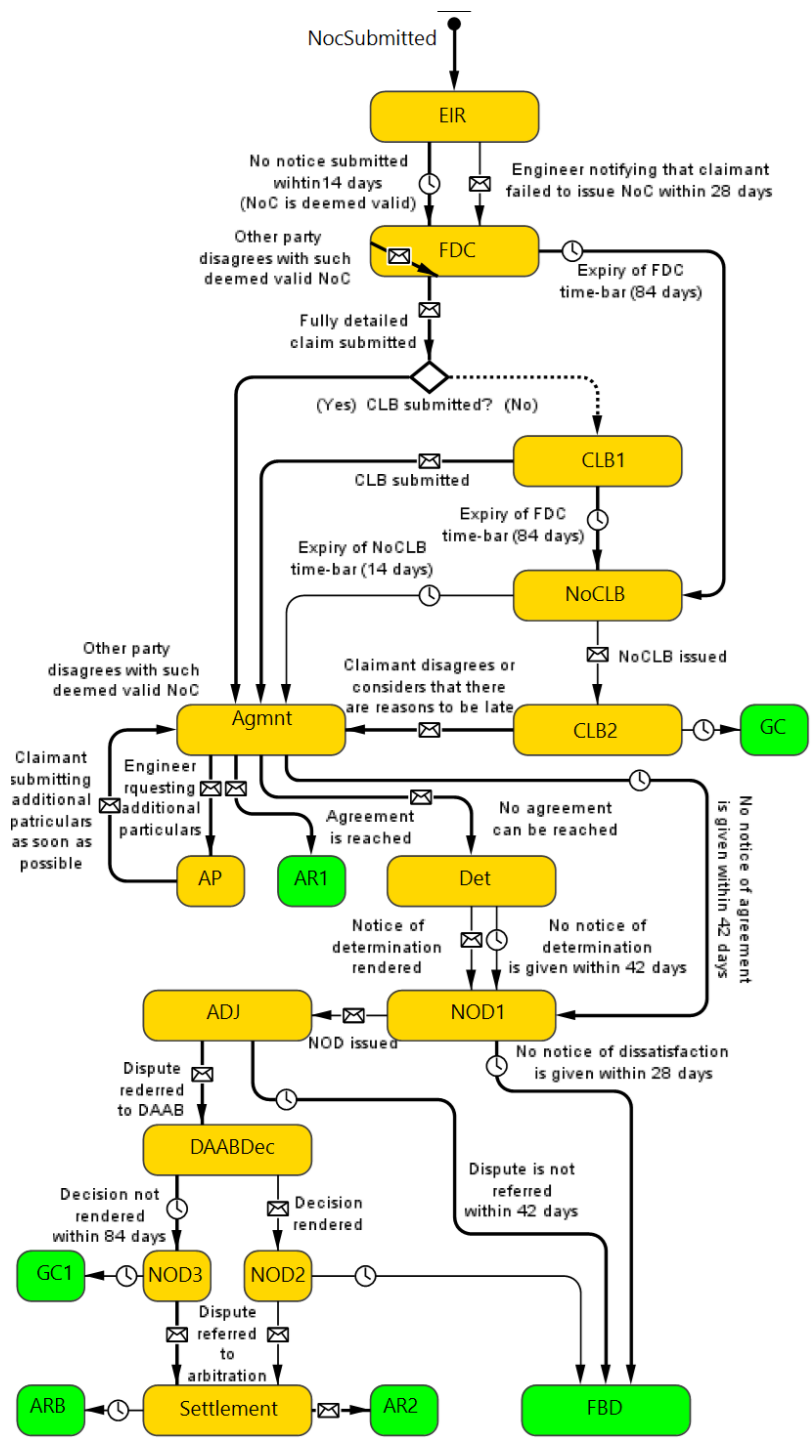


Figure 95. FIDIC Claim Agent Statechart

Otherwise, the claim moves to the “NoCLB” state, where the engineer can issue a notice to the claimant indicating that no contractual legal and/or other bases were submitted within the stipulated period. If this notice was not rendered within 14 days, then the claim moves to the “Agmnt” state. Otherwise, the claim proceeds to the “CLB2” state. Within this state, the claim could either move to the “Agmnt” state, upon the submission of the contractual and/or other legal bases, or to the “GC” state, where the claim is treated a global claim. Once a claim reaches the “Agmnt” state, where the engineer may request additional particulars. In that case, the claim moves to the “AP” state and returns to the “Agmnt” state upon the submission of further particulars. Afterward, the consultations/discussions are initiated where the claim could move to the “AR1” state upon reaching agreement. On the other hand, if no agreement could be reached, the engineer shall issue a notice to proceed to give determination, which shifts the claim to the “Det” state. If no agreement was reached and the engineer failed to issue a notice to proceed to the next phase, then the claim is deemed rejected and automatically moves to the “NOD1” state. Moreover, the claim moves from the “Det” state to the “NOD1” state upon rendering a determination. This applies for the failure of rendering determinations, where claims are deemed rejected. Within the “NOD1” state, either party can issue a notice of dissatisfaction with the engineer’s determination. If the notice of dissatisfaction was not issued within the allotted time, the claim moves to the “FBD” state, where the determination becomes final and binding. Otherwise, the claim moves to the “ADJ” state, where the dissatisfied party shall refer the claim to the

dispute avoidance/adjudication board, which moves the claim to the “DAABDec” state. The failure to do so shifts the claim to the “FBD” state. If the DAAB renders a decision within the allocated time, the claim moves to the “NOD2” state. Otherwise, the claim moves to the “NOD3” state. Within the “NOD2” state, dissatisfied party shall issue a notice of dissatisfaction to initiate the amicable settlement. As such, the claim moves to the “Settlement” state. The failure to issue such a notice shifts the claim to the “FBD” state, where the decision of the DAAB becomes final and binding. Within the “NOD3” state, the claim could move to the “Settlement” state upon issuing a notice of dissatisfaction. IF neither party issued a notice of dissatisfaction within the time specified, the claim moves to the “GC1” state. Eventually, if the claim reaches the “Settlement” state, it could either move to the “AR2” state, upon reaching agreement through amicable settlement, or to the “ARB” state upon initiating arbitration.

g. The JCT Simulation Model

Figure 96 presents the ABM model of the claims/disputes resolution mechanism stipulated under the JCT conditions. The model starts at the “Par” state, where the claimant shall furnish particulars to trigger the resolution process. Upon the issuance of particulars, the claim moves to the “Dec” state, where the architect/contract administrator shall render a decision within a specified period. Prior to render such judgment, the architect/contract administrator may request further particulars, which

shifts the claim back to the “Par” state. Once further particulars are submitting, the claim moves again to the “Dec” state.

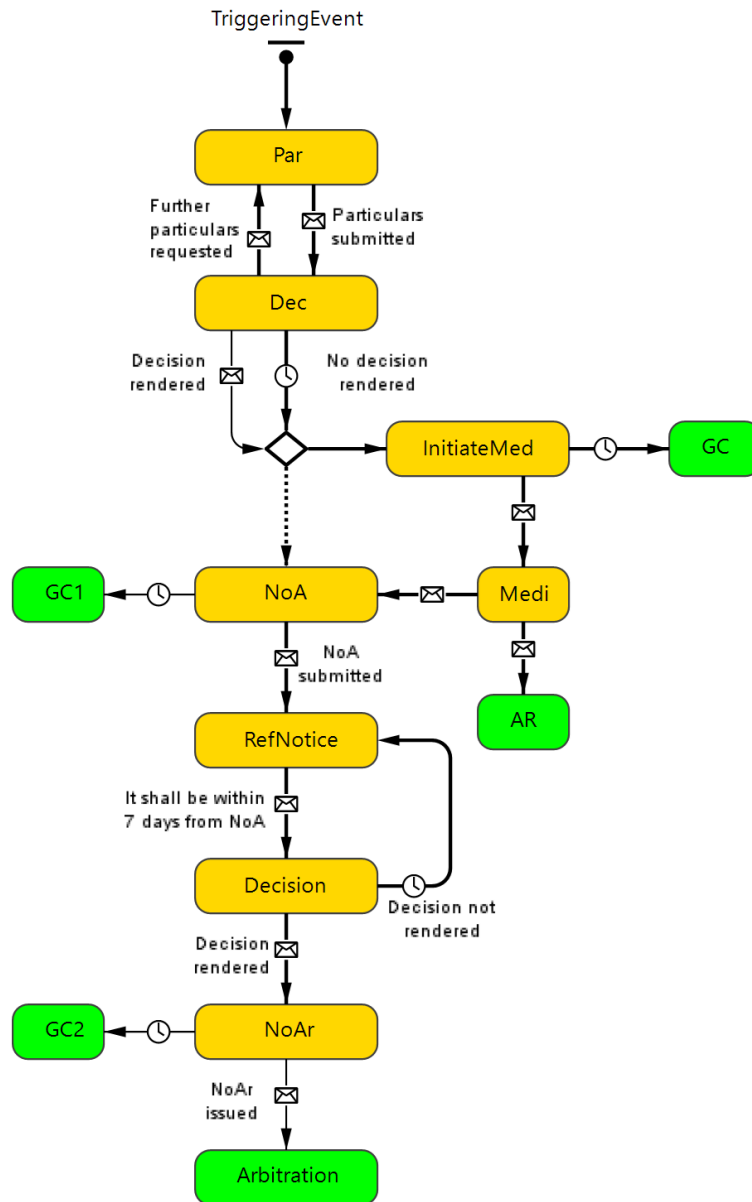


Figure 96. JCT Claim Agent Statechart

Whether or not a decision was rendered, the claim moves either to mediation (“InitiateMed” state) or adjudication (“NoA” state). Under both scenarios, if the claim remains in the corresponding state for more than 30 days, it is considered to become a global claim, where the claim moves to the “GC” or “GC1” state, respectively. If the parties opt to initiate mediation, the claim moves from the “InitiateMed” state to the “Medi” state. If agreement was reached, the claim moves to the “AR” state. Otherwise, the claim moves to adjudication (“NoA” state). Under the “NoA” state, either party shall issue a notice of adjudication, followed by referral notice, to initiate adjudication. As such, the claim moves to the “RefNotice” state then to the “Decision” state. If the adjudicator fails to render a decision within the allocated time, the claim moves back to the “RefNotice”, where the claim must be referred to another adjudicator, who is willing to act and render a decision regarding the matter in dispute. When the decision is rendered, the claim moves to the “NoAr” state. Within that state, either party could issue a notice of arbitration to initiate arbitration. As such the claim moves to the “Arbitration” state. If the claim remains in the “NoAr” state for more than 30 days, it is considered to become a global claim, where it would be shifted to the “GC2” state.

h. The NEC Simulation Model

The developed ABM model of the claim/dispute resolution mechanism stipulated under the NEC conditions is presented in Figure 97. Upon the receipt of the notice of claim,

the project manager shall decide whether or not a change in the contract price, completion date, or key dates is to be offered. As such, the model starts at the “Dec” state. If the change was offered, the claim moves to the “Qtn” state, where the claimant shall submit a quotation. On the contrary, if a change was not offered, the claim shifts directly to the “NOD” state. If the project manager fails to render a decision within the allotted time, the claim proceeds to the “NoF1”.

Within the “NoF1” state, the claim moves to the “Dec2” state if a notification of failure was submitted. Otherwise, the claim ends-up in the “GC” state, where the claim is considered to be treated as a global claim. The options within the “Dec2” state are similar to that of the “Dec” state. However, if the project manager fails to decide on the notice of claim, a change in the contract price, completion date, or key dates is deemed to be offered, where the claim moves to the “Qtn” state. Afterward, the claim moves either to the “Reply” state or to the “PMA” state based on whether or not the quotation was submitted, respectively. Within the “Reply” state, the claim could move back to the “Qtn” state if the project manager requests a revised quotation. On the other hand, the claim could proceed to the “Accepted” state if the claim was accepted. On the contrary, rejecting the quotation shifts the claim to the “NoD” state. Moreover, the claim could move the “PMA” state if the project manager decided to conduct his/her own assessment. If no reply was issued within the stipulated period, the claim moves to the “NoF2” state. Similar to the “NoF1” state, the claim within the “NoF2” state moves to the “Reply2” state if a notification of failure was submitted.

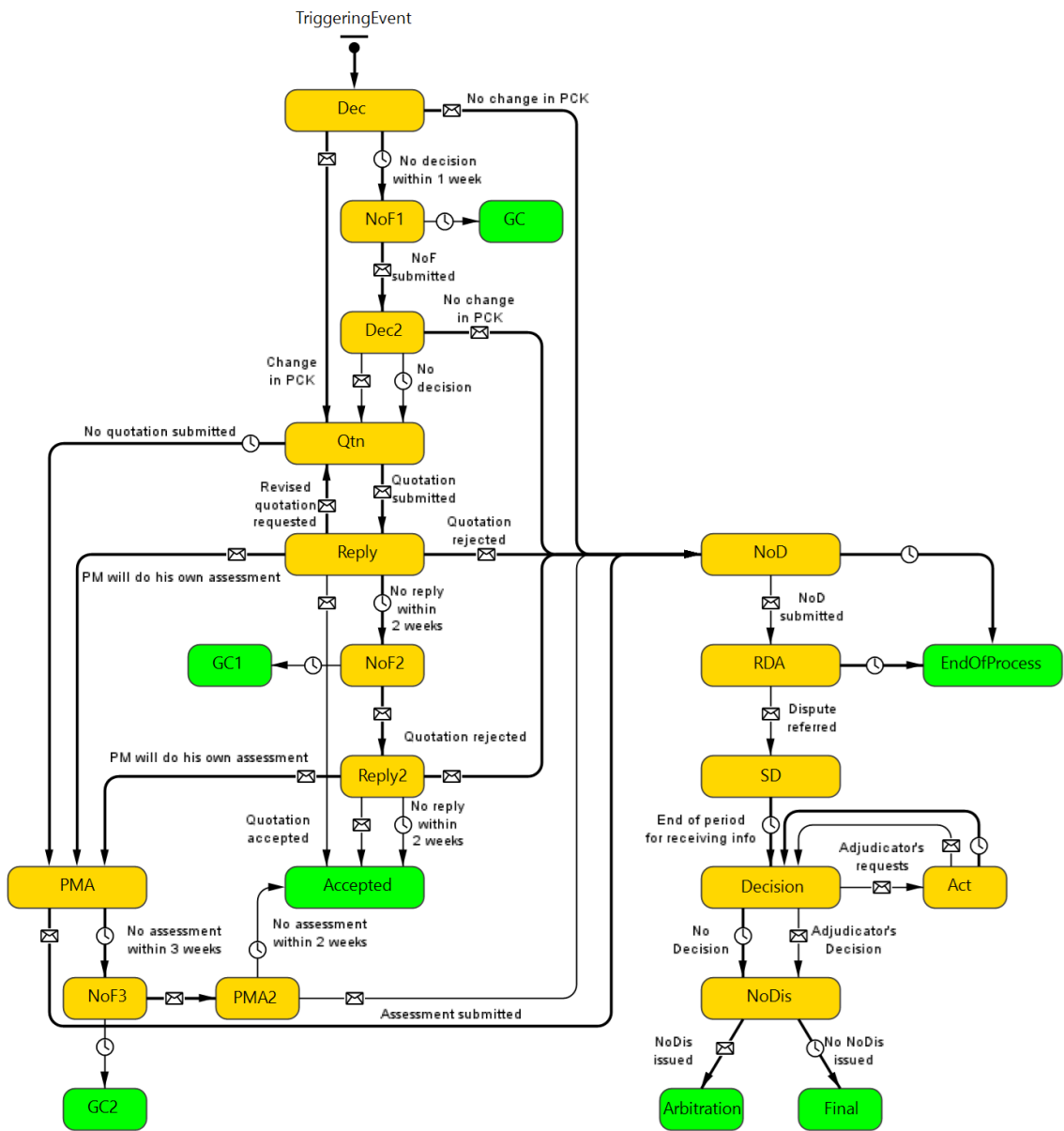


Figure 97. NEC Claim Agent Statechart

Otherwise, the claim ends-up in the “GC1” state, where the claim is considered to be treated as a global claim. The options within the “Reply2” state are similar to that

of the “Reply” state. However, the failure to issue a reply is deemed as accepting the claim. Consequently, the claim moves to the “Accepted” state. Within the “PMA” state, the claim moves to the “NoD” state if the project manager’s assessment was submitted. Otherwise, the claim moves automatically to the “NoF3” state. Similar to the “NoF1” state and to the “NoF2” state, the claim within the “NoF3” state moves to the “PMA2” state if a notification of failure was submitted. Otherwise, the claim ends-up in the “GC2” state, where the claim is considered to be treated as a global claim. The options within the “PMA2” state are similar to that of the “PMA” state. However, the failure to issue a reply is deemed as accepting the claim, which moves the claim to the “Accepted” state. Whenever a claim reaches the “NoD” state, it would automatically proceed to the “EndOfProcess” state if a notice of dissatisfaction was not issued. Otherwise, the claim moves to “RDA” state, where the dissatisfied party shall refer the dispute to adjudication.

As such, the claim moves either to the “SD” state or to the “EndOfProcess” state, based on whether or not the dispute was referred to adjudication, respectively. Within the “SD” state, both parties are offered a period of 30 days to submit supporting particulars. As such, the claim stays in the “SD” state for that period and, then, moves automatically to the “Decision” state. Within the “Decision” state, if the adjudicator requests either party to act, then the claim moves to the “Act” state, where it goes back to the “Decision” state upon acting accordingly. Whether or not a decision is rendered by the adjudicator, the claim moves to “NoDis” state. Within this state, if a party is

dissatisfied with the adjudicator’s decision, that party shall issue a notice of dissatisfaction. Accordingly, the claim moves to the “Arbitration” state. Otherwise, the claim proceeds to the “Final” state, where the decision of the adjudicator becomes final and binding.

6. Results of the ABM Model

Upon running each ABM for 1000 iterations, the frequency of outputs under each model was obtained. Figure 98 presents the results obtained for the AIA’s model. Within this model, claims could be resolved upon reaching agreement through mediation or having a final and binding initial decision upon both parties waiving their rights to pursue mediation or binding dispute resolution. Besides, claims could end-up in an unregulated period, be it prior to the initiation of mediation or binding dispute resolution. If none of the aforementioned results was reached, then claims are referred to binding dispute resolution.

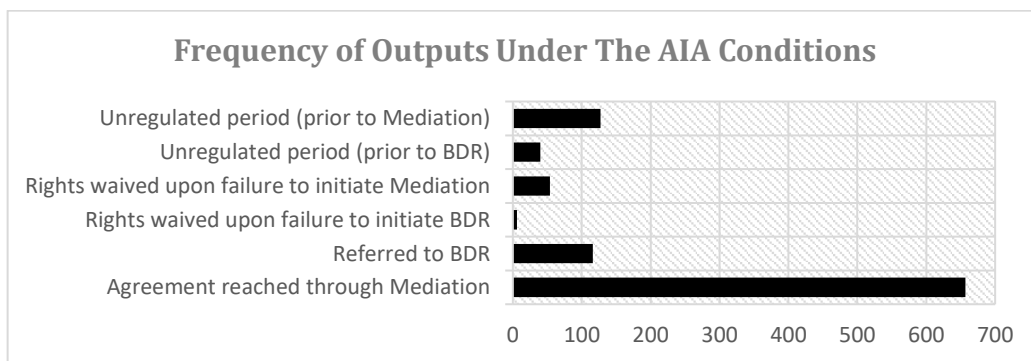


Figure 98. Frequency of Outputs Under The AIA Conditions

The results obtained from the ConsensusDocs’s model are illustrated in Figure 99. Under this model, several possible outcomes are available. In fact, claims could be resolved either upon being approved or upon reaching agreement either through discussions or mediation. Otherwise, claims end-up being referred to binding dispute resolution if not ending-up in any of the unregulated periods.

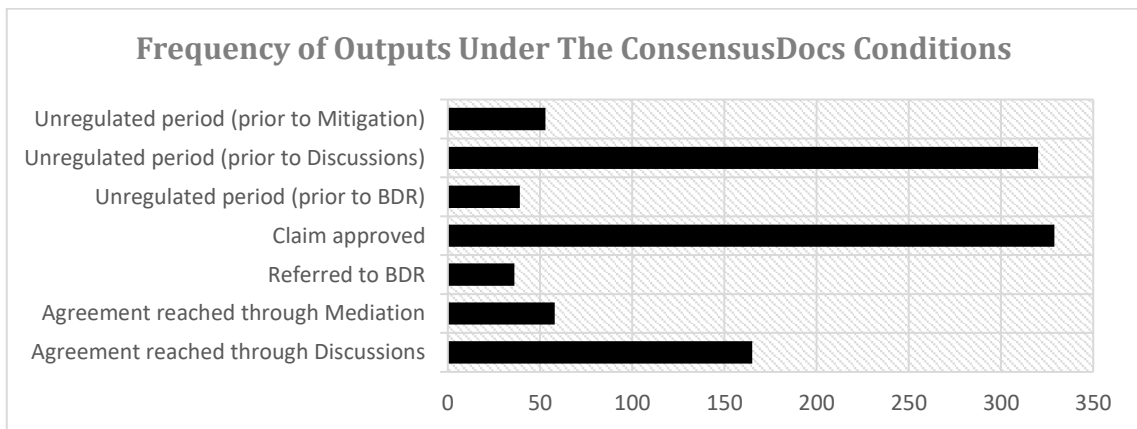


Figure 99. Frequency of Outputs Under The ConsensusDocs Conditions

Under EJCDC, similar possibilities exist. In fact, claims could be resolved either upon having a final and binding judgment, that is rendered by the owner, or upon reaching agreement, that could be either through discussions or through mediation. Otherwise, disputes are referred to final resolution of disputes, if not ending-up in the unregulated period. The frequencies of the obtained possibilities are presented in Figure 100.

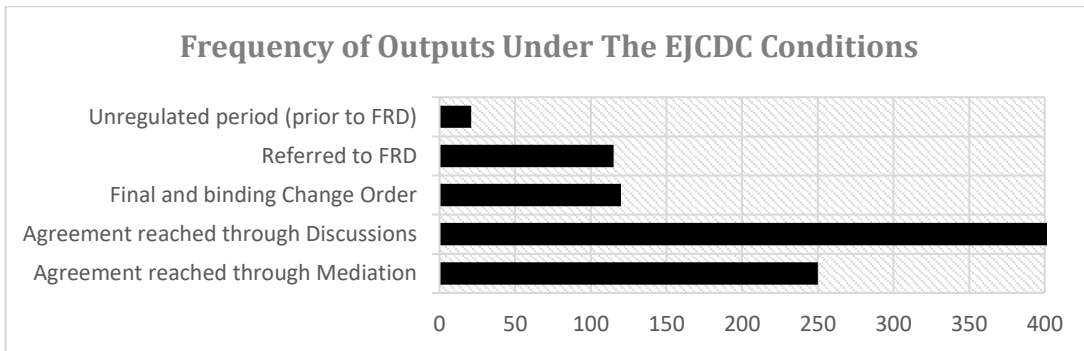


Figure 100. Frequency of Outputs Under The EJCDC Conditions

Figure 101 presents the frequency of outputs obtained from the FIDIC’s ABM model. The array of outputs is divided as follow: (1) having final and binding determination; (2) having final and binding decision; (3) reaching agreement through consultations; (4) resolving disputes through amicable settlement; (5) ending-up in an unregulated period; (6) being referred to arbitration.

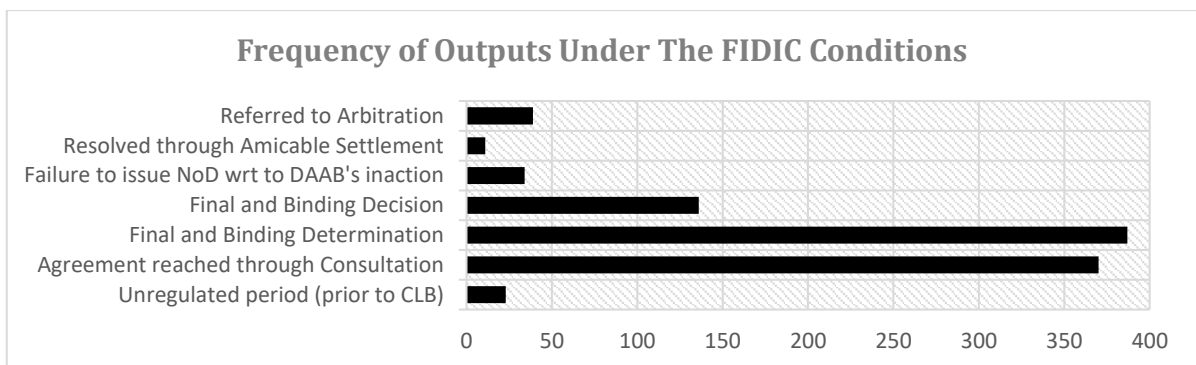


Figure 101. Frequency of Outputs Under The FIDIC Conditions

The JCT's model resulted in 3 outputs, namely (1) reaching agreement through mediation, (2) sticking in an unregulated period, or (3) being referred to arbitration. The frequencies of these outputs are illustrated in Figure 102.

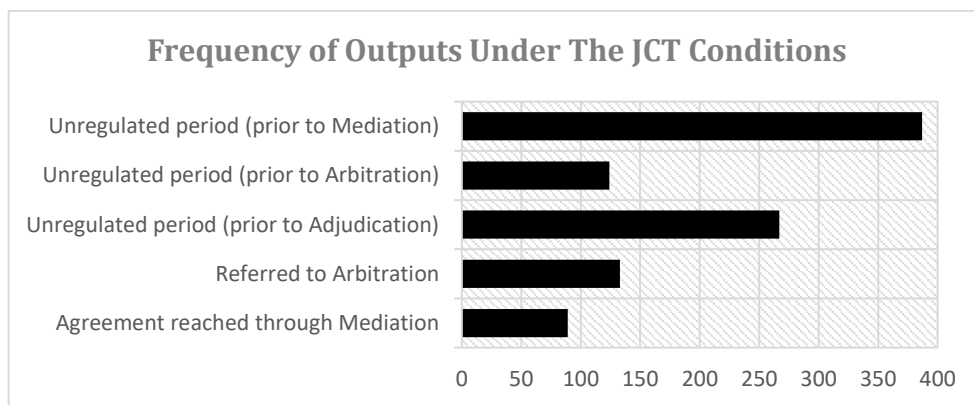


Figure 102. Frequency of Outputs Under The JCT Conditions

Figure 103 reports the frequency of the outputs obtained under the NEC conditions. Under this set of conditions, the claims could be resolved upon being approved, having a final and binding reply or decision, sticking in an unregulated period, or being referred to arbitration.

7. Construction of The Suggested Optimum Claim and Dispute Resolution Mechanism

Based on the constructed ABM models, it was possible to obtain an array of results that was interpreted to not only compare the claims/disputes resolution mechanisms

stipulated under the 6 sets of standard conditions but also to suggest an optimum claim/dispute resolution mechanism. Such mechanism is derived from the all-encompassing timeline upon choosing the most effective option under each module. It is worth mentioning that the owner is the party who defines the conditions of the contracts for any project. As such, the optimum mechanism must serve the interest of the owner since it is the only party who is able to custom-tailor mechanisms. Yet, such mechanism acts as the most effective claim/dispute resolution mechanism upon assuring the highest chances of resolving claims/disputes prior to being referred to arbitration.

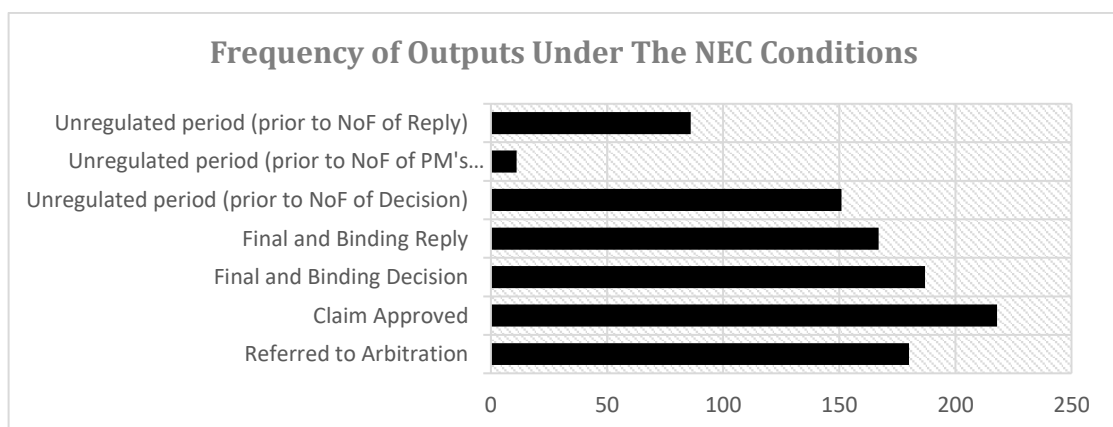


Figure 103. Frequency of Outputs Under The NEC Conditions

a. The Selected Phases

Prior to comparing phases of the claim/dispute resolution mechanism, there is a need to determine what phases shall be included within the suggested optimum claim/dispute resolution mechanism. As a matter of fact, the existence of the disclosure of claim, the

initial judgment, and the arbitration phase is essential to any resolution mechanism. The disclosure of claim phase is an indispensable phase, as it triggers the resolution mechanism. Afterward, there must be a render judgment to decide on the submitted claim. Eventually, the arbitration phase should exist as a final resort, where contracting parties shall refer matters in dispute to arbitration if resolution was not possible to be reached.

However, the phases of discussions/consultation, mediation, and adjudication are not common among all standardized mechanism.

As such, there is a need to evaluate their effectiveness to decide whether or not they should be adopted in the suggested-optimum mechanism. In general, under any claim/dispute resolution mechanism, a claim could either be resolved, be stuck in an unregulated period, or be referred to arbitration. Figure 104 reports the percentages of claim not being resolved, that it is the summation of the percentages of claims ending-up in unregulated periods and the ones referred to arbitration. On the other hand, Table 23 shows the resolution rooms available under each set of standard conditions.

Based on Figure 104, it can be noticed that the mechanism stipulated under the FIDIC conditions resulted in the minimal percentage of claims not being resolved. This could be justified upon checking the number of resolution rooms available, where the mechanism stipulated under the FIDIC conditions is the only one that imposes 4 rooms for resolution. As such, it can be argued that the existence of all 3 resolution rooms,

beside that of initial judgment, is crucial to have the most effective claim/dispute resolution mechanism upon reducing the number of unresolved claims.

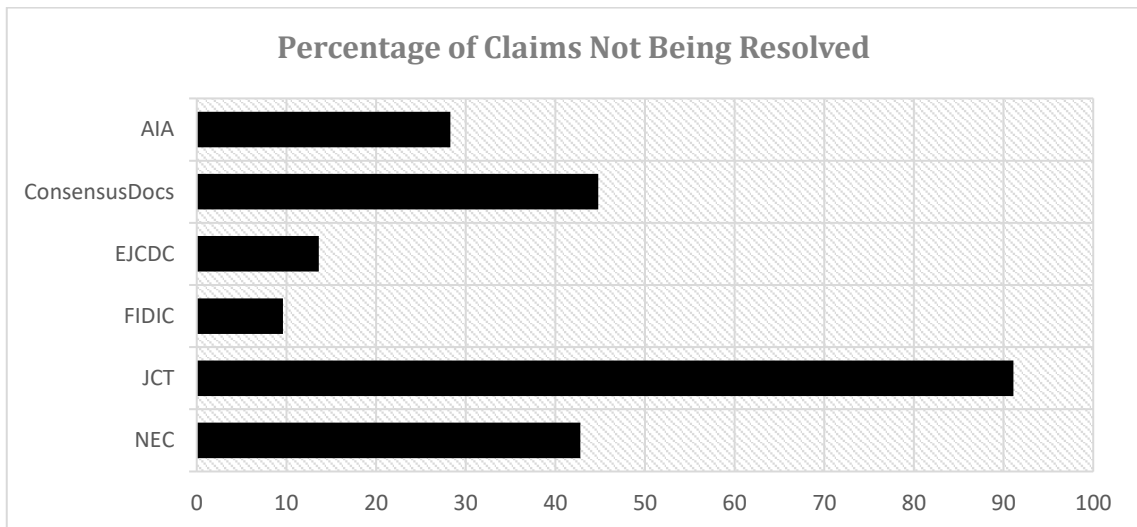


Figure 104. Percentage of Claims Not Being Resolved

Table 23. Resolution Rooms

Set of Standard Conditions	Initial Judgment	Consultation	Mediation	Adjudication	Total Rooms
AIA	X		X		2
ConsensusDocs	X	X	X		3
EJCDC	X	X	X		3
FIDIC	X	X	X	X	4
JCT	X		X	X	3
NEC	X			X	2

b. Initial Judgment

Based on the submitted claim, the judgment-rendering party needs to issue an initial judgment. Although the initial judgment is common across all mechanisms, the average

time upon which the initial judgment is rendered vary, as shown in Figure 105. From the perspective of the owner, the best mechanism is the one that offers the latest time to render initial judgments. This is based on the fact that the owners prefer to defer payments as much as possible. As such, it can be argued that the best mechanisms of rendering judgments are the ones stipulated under the FIDIC and the JCT conditions, where they offer an average time of more than 100 days to render initial judgments.

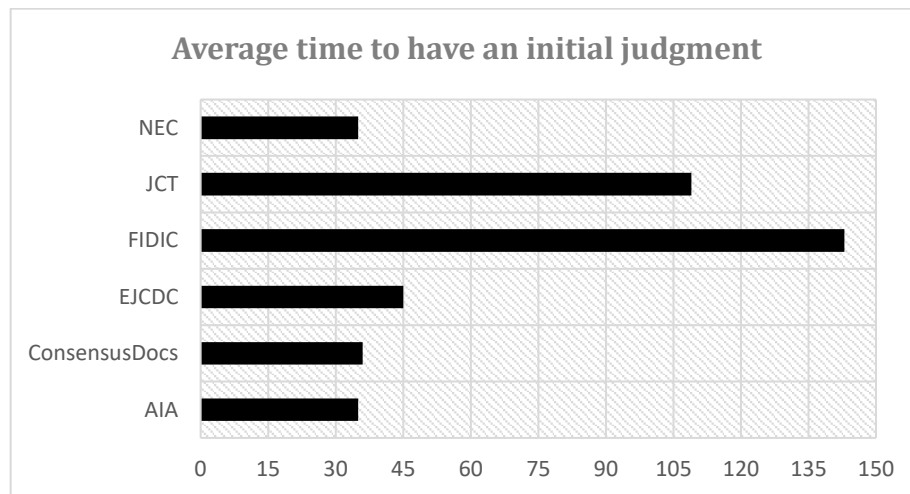


Figure 105. Average Time to Have an Initial Judgment

What actually affects the average time to render judgments is not only the property of the initial judgment phase but also the properties of all preceding phases, namely the disclosure of claim. Among the ones stipulated, the duration of the disclosure of claim phase is largest under the FIDIC and NEC conditions (84 days). On the hand the JCT conditions sets a limitless duration upon specifying the corresponding

time-bar as “as soon as possible”. However, this leads to nonregulating the disclosure process, where claims would be stuck in the unregulated periods for a long period of time. Therefore, owners must avoid such dilemma though imposing a prolonged period. As such, the properties of the disclosure of claim phase under the NEC and the FIDIC conditions can be viewed to be the best ones as compared to others. However, the disclosure of claim phase under the NEC conditions impose several indirect-unregulated periods, that surface upon the inaction of the project manager. To avoid such problem, it is suggested to choose the disclosure of claim phase that is stipulated under the FIDIC conditions.

In summary, the disclosure of claim phase and the initial judgment phase that are stipulated under the FIDIC conditions shall be selected when formulating the most effective time-line. However, the FIDIC conditions impose a consultation phase prior to that of initial judgment. Thus, should it be adopted as is? Or should it be placed elsewhere?

c. Discussions/Consultations

Upon checking the results of the simulation model, it was noticed that the percentages of claims being resolved through consultations are as shown in Figure 106. The discussions phase is adopted only under the ConsensusDocs, the EJCDC, and the FIDIC conditions. The discussions phase could be either staged prior to the initial judgment

phase, as in the cases of the EJCDC's and the FIDIC's mechanism, or after the initial judgment phase, as in the case of the ConsensusDocs's mechanism.

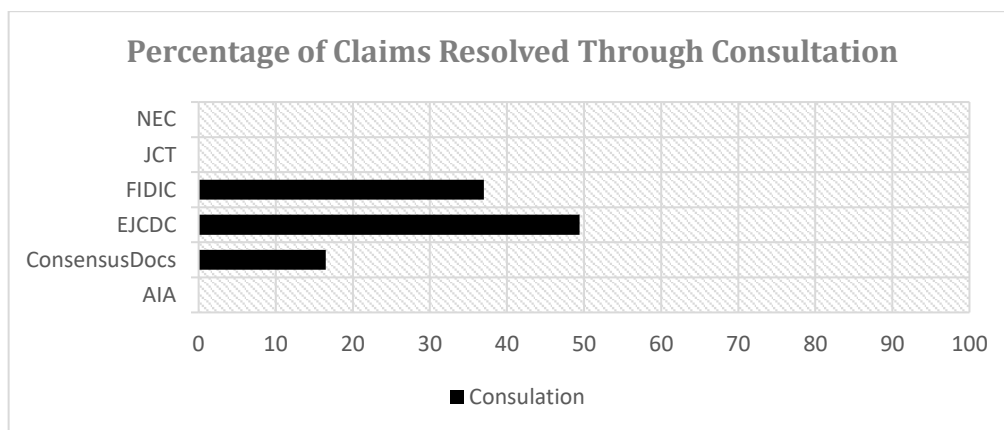


Figure 106. Percentage of Claims Resolved Through Consultation

Based on Figure 103, it can be noticed that the discussions/consultation phase under the EJCDC and the FIDIC conditions is more effective than that under the ConsensusDocs conditions. Therefore, it can be argued that the discussions/consultation phase would be more effective if implemented prior to the initial judgment phase.

Beside deciding on the staging sequence of the discussion phase, there is a need to select the most effective operational mechanism. The EJCDC conditions offer a 90-day period for discussions as compared to 42 days under the FIDIC conditions. However, the 90-day period accounts for mediation (60 days) and rendering initial judgment by the owner. Hence, it can be argued that the actual duration allocated for

discussions is less than or equal to that of FIDIC. It is noteworthy to mention that the FIDIC conditions allow the extension of the discussion's period.

The discussions phase under the EJCDC conditions could be suspended upon rendering a judgment by the owner, that could take place at any time within the discussions phase. On the other hand, the FIDIC conditions stipulated that if there is no possibility to reach agreement, both parties shall mutually inform the engineer as such to proceed to the next phase. This could be argued to offer a more effective mechanism upon not allowing either party to terminate discussions unilaterally. Therefore, it is suggested to adopt the mechanism of discussions that is stipulated under the FIDIC conditions.

d. Adjudication

The adjudication phase is adopted under the FIDIC, the JCT, and the NEC conditions. However, the one stipulated under the JCT conditions can be discarded, as it does not result in a final and binding decision. The operational mechanisms adopted by the other two sets of conditions are almost the same, where the referring party shall issue a notice of adjudication and, then, refer the dispute to adjudication. If either gate was not fulfilled, then the initial judgment becomes final and binding. As such, either operational mechanism can be chosen.

e. Mediation

The mediation process is a nonbinding dispute resolution process that is adopted by all sets of standard conditions, except the NEC ones. As discussed in the previous chapter, various variations in the operational mechanisms of mediation exist. As such, the percentages of claims resolved through mediation, presented in Figure 107, were obtained from the simulation models to determine the most effective operational mechanism.

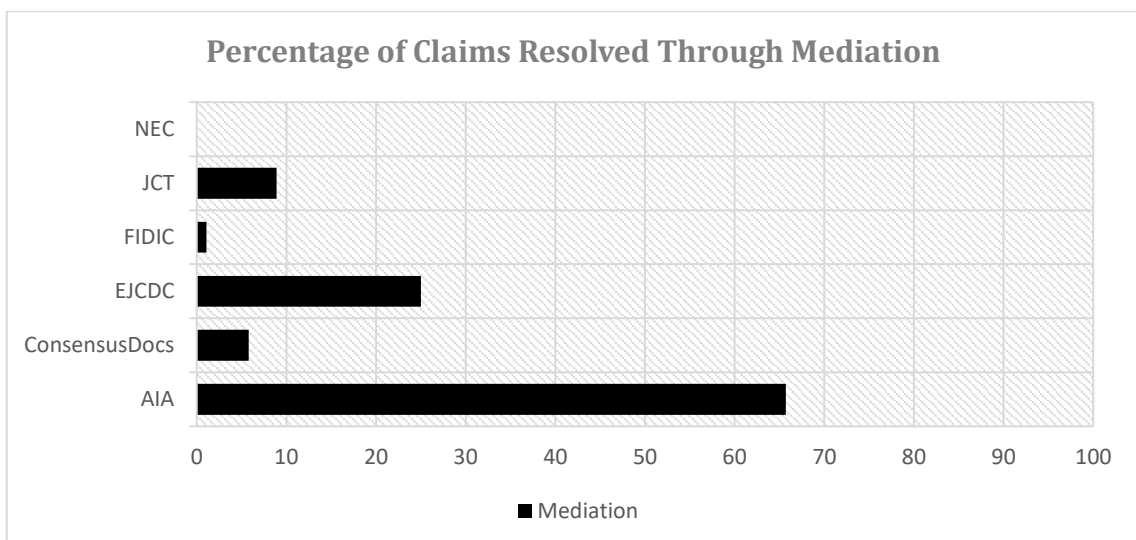


Figure 107. Percentage of Claims Resolved Through Mediation

The AIA conditions had the highest percentage of resolving claims through mediation, as compared to all other sets of standard conditions. This could be vindicated by the unique properties of the mediation process that is stipulated under the AIA

conditions. Firstly, mediation is mandatory, under the AIA conditions, where it acts as a condition precedent to arbitration. This applies to the case of the ConsensusDocs conditions if the contracting parties opt to refer disputes to mediation rather than referring them to mitigation. On the contrary, mediation is optional under the other ones. Secondly, the AIA conditions do not only allow either party to initiate the mediation process unilaterally but also to enforce the other party to file for mediation, where both parties would waive their rights if the demanded party failed to act as such. None of the other sets of standard conditions impose a similar initiation mechanism for the mediation process. For these reasons, it is suggested to adopt the operational mechanism of the mediation process that is stipulated under the AIA conditions.

As for the staging sequence of the mediation process, there are three possible options: (1) prior to the initial judgment phase, (2) prior to adjudication, (3) prior to arbitration. Regarding the first option, it can be argued that there is a possibility that claimants might be satisfied with the initial judgment. As such, staging mediation prior to the rendering of initial judgment could lead to the unnecessary referral of claims to mediation. Therefore, the first option is discarded. By similar analogy, there is a possibility that contracting parties might be satisfied with the decision rendered by the adjudicators. As such, staging mediation prior to adjudication could lead to the unnecessary referral of claims to mediation. Consequently, the most suitable staging sequence for mediation is prior to arbitration.

8. The Suggested Optimum Claim/Dispute Resolution Mechanism

Based on the finding of the previous, it was possible to construct the suggested optimum claim/dispute resolution mechanism, as shown in Figure 108. Up to the phase of adjudication, the mechanism is identical to that of FIDIC, except for modifying the duration of consultation phase, to be 90 days, and that of adjudication, to be 56 days. Following adjudication, the mediation process of the AIA's claim/dispute resolution mechanism was implemented. Upon the issuance of the notice of dissatisfaction with the adjudication's decision, either party can demand the other party, within 30 days after issuing the notice of dissatisfaction, to file for mediation within a period of 30 days. Failure to comply to such demand waives the rights of both parties to pursue mediation and arbitration. As such, the adjudication's decision becomes final and binding. On the other hand, if neither party placed a demand for the other party to file for mediation, then either party could refer the matter in dispute to mediation at any time. Afterward, the claim progress in compliance with the operational mechanism of the mediation process under the AIA conditions.

The suggestion of the optimum claim/dispute resolution mechanism is momentous, as it offers the most effective mechanism. Such mechanism is capable of decreasing the number of disputes being referred to arbitration upon increasing the number of disputes being resolved through (1) consultation, (2) having a final and binding initial judgment, (3) having a final and binding decision (adjudication), and (4) mediation. Therefore, owners, who adopt any set of conditions, are recommended to

modify the underlying claim/dispute resolution mechanism to be as the suggested-optimum one.

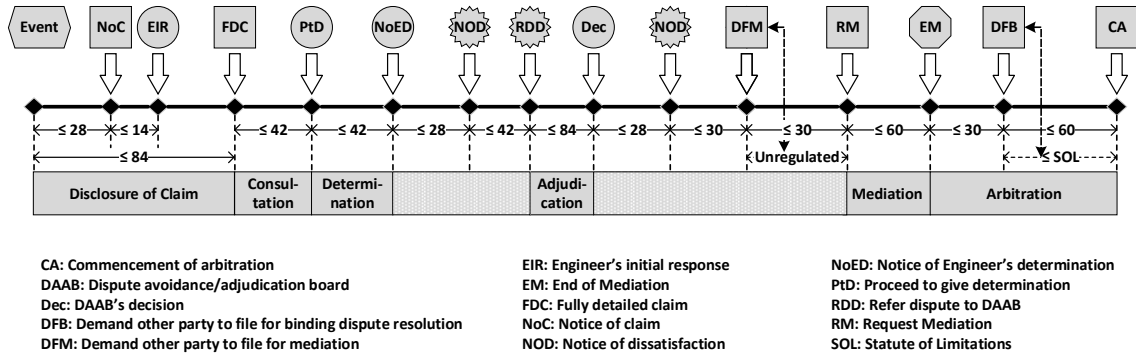


Figure 108. The Suggested-Optimum Claim/Dispute Resolution Mechanism

CHAPTER VIII

CONCLUSION AND RECOMMENDATIONS

A. Preamble

The successful delivery of project does not only depend on delivering the project on time and within budget but also on how contracting parties approach conflicts, that are proven to be inevitable in construction projects. To this end, the contract conditions adopt a claim/dispute mechanism to administer the resolution process of claims. It is noteworthy to mention that claims are never reduced with time if left unresolved. In fact, claims evolve into disputes and could lead to major consequences, namely impacting negatively the relationship and communication of the contracting parties. This levies the need to have an efficient claim/dispute resolution mechanism.

It goes without saying that regulating the process by following claim provisions within the conditions of standard contract types, such as AIA, EJCDC, ConsensusDocs, FIDIC, NEC, and JCT, is an acceptable first-step initiative in the direction of resolving arising conflicts. However, the underlying mechanisms have different stages, sequencing, time-bars, and properties. Therefore, the adoption of a certain contract type for conflict resolution might not always provide optimal outcomes in varying scenarios and circumstances.

In fact, contract conditions governing the administration of construction claims and disputes play a critical role, and their underlying resolution mechanisms are expected to be efficient and expeditious to counteract detrimental repercussions of unresolved claims on the progress of the project and the relationship among contracting parties. However, none of the previous research efforts has designed a framework to measure the efficiency of a certain claim/dispute mechanism or has derived an optimal claim/dispute mechanism to better resolve claims. In this regard, this research conducts a detailed comparative analysis of the claim/dispute resolution mechanisms, that are stipulated under the AIA, the EJCDC, the ConsensusDocs, the FIDIC, the NEC, and the JCT conditions, in an endeavor to reach an optimum claim/dispute resolution mechanism.

This chapter offers (1) a summary of the research methodology adopted, (2) contributions of this study, (3) recommendations to practitioners, and (4) limitations of the conducted study and suggestions for future research.

B. Summary of Methodology

The aim of this study is to propose an optimum claim/dispute resolution mechanism that would highly effective in resolving claims/disputes. Therefore, a methodology of three phases was developed. Within the first phase, the claim/dispute provisions stipulated under the AIA, ConsensusDocs, EJCDC, FIDIC, JCT, and NEC standard conditions

were meticulously examined to formulate standardized global timelines and draw the underlying mechanisms and respective stage properties.

This was the input of phase 2, where detailed frameworks of each standardized mechanism were developed upon encountering all scenarios that could possibly occur. Within phase 2 also, a comparative analysis of the examined standards was conducted to highlight the similarities and differences. As such, comparison variables were devised, and their attributes were extracted from the detailed properties identified in the first phase. Eventually, phase 2 concludes with the development of an all-encompassing timeline consisting of several sub- modules. Within every module, all possibilities encountered within the underlying mechanisms were incorporated. Consequently, a comprehensive mechanism was generated. This can be utilized as a point of reference for contracting parties to check alternatives that are implemented in other standards.

Within the comprehensive mechanism, different possibilities had to be evaluated. As such, the third phase of methodology was about conducting simulation using agent- based modeling. Eventually, the results of the simulation models were analyzed to suggest the most effective/optimum claim/dispute resolution mechanism.

C. Contributions

The conducted research has momentous findings. Firstly, the different operational properties stipulated under different sets of standard conditions cause claims/dispute resolution mechanisms to perform differently, where some mechanisms expedite the

resolution process while other hinder it. In fact, it was found that one of the most expeditious mechanisms is the one stipulated under the AIA conditions, which allows either party not only to unilaterally trigger the mediation and binding dispute resolution mechanisms but also to regulate the triggering period of such mechanism upon demanding the other party to file for either mechanism within a limited period. On the contrary, the JCT conditions were found to offer the most protracted resolution mechanism upon not stipulated time-frames for the disclosure of claim phases, which could lead to claims being prolonged to undesirably long periods of time. This performed analysis is of great value to contract administration professionals functioning under both owners and contractors of construction projects. On the one hand, instead of being exposed to only one set of contract conditions, owners and their contract administration practitioners can benefit immensely when being informed of, and becoming fully familiar with, the full spectrum of possible mechanisms and their associated operational variations. On the other hand, while grasping the chance to be much better informed of what the reasonable claim/dispute mechanisms may ideally be comprised of, construction contractors shall be able to better benchmark the mechanisms included in projects' tender documents and possibly improve their contract terms negotiation position prior to executing the construction contract. Secondly, the overview of the spectrum of judgment-rendering roles revealed that engineering professionals shall act under different capacities when exercising these roles. Consequently, a set of general guiding principles was formulated, where contracting

professionals must abide with when rendering judgments. Thirdly, the full continuum of the multiple phases under different sets of standard conditions – and their sequence – contributed to the construction of an all-encompassing mechanism. Such holistic mechanism merges all options that could be encountered under any set of standard conditions. The proposed all-encompassing timeline affords owners an unprecedented opportunity to custom-tailor their contracts' claim/dispute resolution mechanisms, without jeopardizing the integrity of any chosen/preferred design. Fourthly, the agent-based modeling simulation showed that none of the standardized mechanism endorsed a full set of optimal phases. In fact, the proposed optimal claim/dispute resolution framework was a combination of phases stipulated under different sets of standard conditions, namely those offered by FIDIC and AIA. By referring to the suggested optimal framework, practitioners will be able to enhance the functionality of resolution mechanisms and to avoid the detrimental repercussions of unresolved conflicts.

D. Recommendations

In relation to the field of claims/disputes administration and resolution, this study contributes to the knowledge of the resolution mechanisms of claims/disputes. The obtained results highlight the fact that none of the standardized mechanisms is the most effective one. As such, there might be a need to adopt additional phases or discard some of the existing ones. In addition, there might be a need to adjust the operational mechanism of some phases. Therefore, the findings of this study contribute to practice

of claims/disputes by offering the most-effective resolution mechanism. Based on the findings of this research, several recommendations could be offered to practitioners regarding the claim/dispute resolution process:

1. Disclosure of Claim Phase: It was proven that the one stipulated under the FIDIC conditions was the best among others. As such, the operational mechanism, stipulated under the FIDIC conditions, is recommended to be adopted.
2. Consultation Phase: It is recommended to stage this phase prior to the initial judgment, while adopting the longest period possible among the available sets of standards, that is 90 days.
3. Initial Judgment: The simulation results showed that the initial judgment phase of the FIDIC conditions suits the owner the most upon offering the longest average time to render initial judgment. Hence, the operational mechanism of the relevant phase is recommended to be that of the one stipulated under the FIDIC conditions.
4. Adjudication: The simulation results necessitate the need for an adjudication phase. In this regard, the FIDIC and the NEC conditions offer the best phases for adjudication. However, the duration of adjudication is less under the NEC conditions. To this end, it can be argued that having an earlier deadline helps the adjudicators to render decisions. As such it is recommended to adopt the

operational mechanism stipulated under the FIDIC conditions, while allotting a period of 56 days for adjudicators to render disputes

5. Mediation: It was shown that mediation shall be placed after the adjudication and prior to arbitration. Moreover, the AIA conditions offer the most effective operation mechanism. As such the mediation process of the AIA conditions shall be adopted and placed prior to the initiation of arbitration.

E. Limitations and Future Work

The constructed simulation model has several limitations, as follows:

1. Number of claims resolved per iteration: It was assumed in the ABM model that a group of one owner, one contractor, and one engineering professional deals with only one claim at a time. Further work will be carried out to have all parties deal with several claims simultaneously, which might affect the behavior of the corresponding parties.
2. The characteristics of the agents: The proposed ABM model assumed that all agents of the same type behave similarly. For illustration, all owners react similarly to the submitted claim. In the future, work will be done to allocate a unique set of characteristics to each agent type, which in turn will affect their behavior.

3. Type of claim: The type of claims was not considered in the simulation model. Future work will tackle various types such as time-extension claims and money-related claims and study their effect on the whole process.
4. Claimant: The ABM model did not take into consideration the party who filed the claim. In the future, the model will be furtherly developed to show such details, which could contribute to the behavior of involved parties.
5. Time at which the claim was filed: The simulation model did not take the time at which a claim is filed into consideration. Future work will assume that a claim can be filed at any time within the project's life cycle and, accordingly, will study the impact of this change on the outcome of the claim/dispute resolution mechanism.
6. Time to take actions: The time to take actions was assumed to be a triangular distribution. In the future, this will be studied further to include the right distribution that best fits the actual behavior of agents.
7. Percentage of actions vs. inactions: It was assumed that 85% of the times the agent is able to successfully take an action within the available time. However, this percentage might differ from one agent to another and from one action to another. This will be addressed in future work upon considering stochastic ranges.
8. Reaction to judgments: It was not possible to model how agents would react to a rendered judgment. To cover all possible scenarios, the agent's reaction was

considered to be totally random. In the future, characteristics of the rendered judgment will be added, which affects how parties would react to such judgments.

9. Learning and adaptative behavior: In the future, the experience of the parties involved will be integrated into the model to reflect some adaptive behavior.
10. Project delivery method: The simulation model assumed a design-bid-build delivery method. In the future, the model will be upgraded to represent other delivery methods.
11. Validating model using case studies: Future work will consider case studies to validate the simulation model, where it will be possible to check if timings obtained from the model fall within the range of how much it took to resolve such claims.

When developing the model further, these limitations will be handled one at a time.

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