

**DETERMINING INFLUENCING FACTORS AND PREDICTING
DISPUTE OUTCOME OF VARIATION CLAIMS IN INDIAN
CONSTRUCTION CONTRACTS**

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**DEPARTMENT OF CIVIL ENGINEERING
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DISPUTE OUTCOME OF VARIATION CLAIMS IN INDIAN
CONSTRUCTION CONTRACTS**

by

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Department Of Civil Engineering

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*I dedicate this effort
To
Lord Yogeshwara
and
Reverend Dadaji, Late Shri. Pandurang Shastri Athavale,
Founder of Swadhayaya Pariwar,
who endowed into me the spirit of
“Indwelling God” and the teachings of “Bhagwad Geeta”
which has knowingly and unknowingly cultivated my value systems and convictions
and which enabled me to be where I am today.
I dedicate this entire effort and my life at his lotus feet.*

CERTIFICATE

This is to certify that the thesis entitled “**Determining Influencing Factors and Predicting Dispute Outcome of Variation Claims in Indian Construction Contracts**” being submitted by **Mrs. Smita Krishnarao Patil** (Entry No. 2010CEZ8733) to the **Indian Institute of Technology Delhi**, for the award of the degree of **Doctor of Philosophy**, is a bonafide record of the research work carried out by her. She has worked under our guidance and supervision and has fulfilled the requirements for submission of this thesis, which to our knowledge has reached the requisite standard.

The results contained in this thesis have not been submitted in part or in full, to any other University or Institute for the award of any degree or diploma.

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Smita Patil

ABSTRACT

Unprecedented rate of growth of technology and modernization over last few decades has resulted in an infrastructure boom in India. Majority of these construction projects are carried out through contracts. Contract document plays a dominant role in preventing and resolving disputes in the construction contracts by providing complete coverage of all the items of work, duties and responsibilities of the contracting parties, and conflict resolution mechanisms related to all contingencies.

With the increasing size and complexity in nature of projects the conditions of the contracts also tend to become more complicated, which in turn add to number of disputes to already existing ones and further delay the settlement of disputes. The delay in disputes apart from hampering project progress and damaging relationship between parties of contract also contributes to the cost and time overruns, ultimately affecting the national progress. This scenario demands for a development of scientific methodology to help judiciary to check the number of disputes.

A study of various court cases and arbitration awards related to variations in construction contracts is carried out which highlights the various claims arising out of the variations in a construction project. An attempt has been made to integrate maximum information related to the disputes arising out of Variation clause in Indian Construction Contracts.

Adjudication of disputes through the arbitration process, cases or a court involves, detailed and through analysis of facts and evidences related to the case before arriving at the final decision. The decision process of the arbitrator or judge is influenced by various factors related to the case. These factors, called as “Intrinsic factors” facilitate arbitrators in pronouncing the award. They are directly related to the facts and vary from case to case. The research identifies sixteen such factors

through case study approach and seeking consensus of expert arbitrators for the same through a questionnaire survey.

The research further developed a dispute resolution framework by employing neural networks based on the Intrinsic Factors influencing decision making of arbitrators related to 203 claims from seventy two awards arising due to variation to predict the outcome of the dispute. The neural network model is developed which has a prediction rate of 100% for ten test cases extracted from awards, while for the Supreme Court cases it has a prediction rate of 75%. This model aims at predicting solutions for the dispute resolution much faster than the prevailing system of arbitration and litigation helping the professionals to understand the results of the dispute claims.

It is also observed that in spite of the facts and related backgrounds being same in several cases, the decisions vary. This indicates that there are some factors extraneous to the facts of the cases influencing the decision of the adjudicator. These “Extrinsic factors” could be the courtroom/arbitration venue condition; situations; attributes and personality traits of the adjudicator. In view of this background, this research study identifies and evaluates the impact of arbitrator’s attributes and personality traits on adjudicator’s decision. A total of twelve extrinsic factors were identified. The influence of these attributes on adjudicator’s decision was measured through 54 personality trait questions and four sample cases. The study revealed that arbitrator’s past experience in handling number of cases; neuroticism; dominance; and fairness are the four significant factors that influence the decision making of Arbitrators. Arbitrator appointing authority can make use of these to check if the candidate arbitrator possesses these traits before final appointment.

KEY WORDS: *Construction contracts; Construction Disputes; Dispute Resolution; Arbitration; Variation claims; Intrinsic factors; Extrinsic factors; Personality Traits; Neural Networks.*

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LIST OF ABBREVIATIONS

ABBREVIATION	FULL FORM
ADR	Alternative Dispute Resolution
AI	Artificial Intelligence
AIR	All India Reporter
ANN	Artificial Neural Networks
ArbLR	Arbitration Law Reporter
BDT	Boosted Decision Trees
BOQ	Bill of quantities
CBR	Case Based Reasoning
CPWD	Central Public Works Department
DSS	Decision Support System
FIDIC	International Federation of Consulting Engineers
GDP	Gross Domestic Product
GFF	General Feed Forward
IR	Information Retrieval
KBES	Knowledge-Based Expert System
MAP	Multi-dimensional Assessment of Personality
MES	Military Engineering Services
ML	Machine Learning
MLP	Multilayer Perceptron
NB	Naïve Bayes
NN	Neural Networks
PART	Projective Adaptive Resonance Theory
PSO	Particle Swarm Optimization
PWD	Public Works Department
SPSS	Statistical package for social sciences
SVM	Support Vector Machines