RISK ANALYSIS AND DECISION MAKING IN CONSTRUCTION CLAIMS

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Outline

- Paper Objectives
- Statement of Research
- Literature Review
- Proposed Method
- Conclusion

Research Objectives

- Risk Analysis of Construction claims from economic standpoint
- Defining causation and reasoning of claims with Bayesian Networks
- Refining models of bargaining process for construction claims
- Considerations and elements in analysis of Pretrial Negotiations and equilibrium concept for settlement

Statement of Research

- Best actions or strategies?
- Most desirable outcomes?
- information and beliefs of each party?
- Thresholds for accepting or rejecting settlement offers?
- Why do cases fail to settle?
- Current claims and settlements in the industry
- Influence of Jury system, Board of appeals, attorneys, etc.

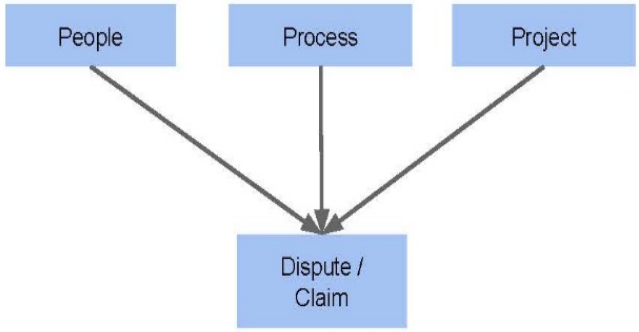
Contract Dispute predictors

Construction of Multi-Attribute Dispute Hierarchy

Construction Industry Institute (CII) to calculate Dispute Potential Index (Likelihood of contract dispute)

Main Characteristics

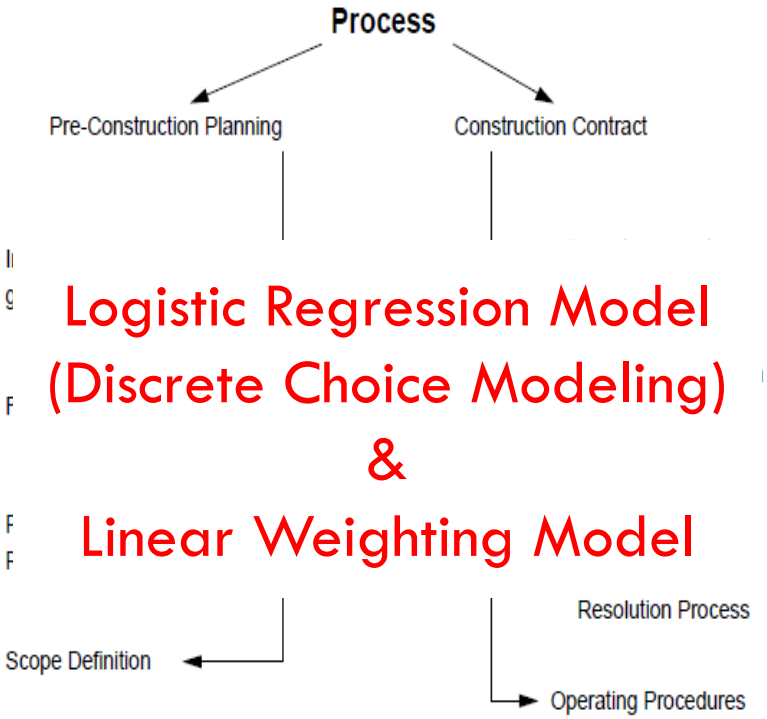
- People
  organizations, relationships, roles, responsibilities, and expectations
- Project
  technical nature of the work, type and complexity of a project, limitations of the environment
- Process
  Planning, financial and scope definition, contractual obligations, risk allocation, administrative procedures



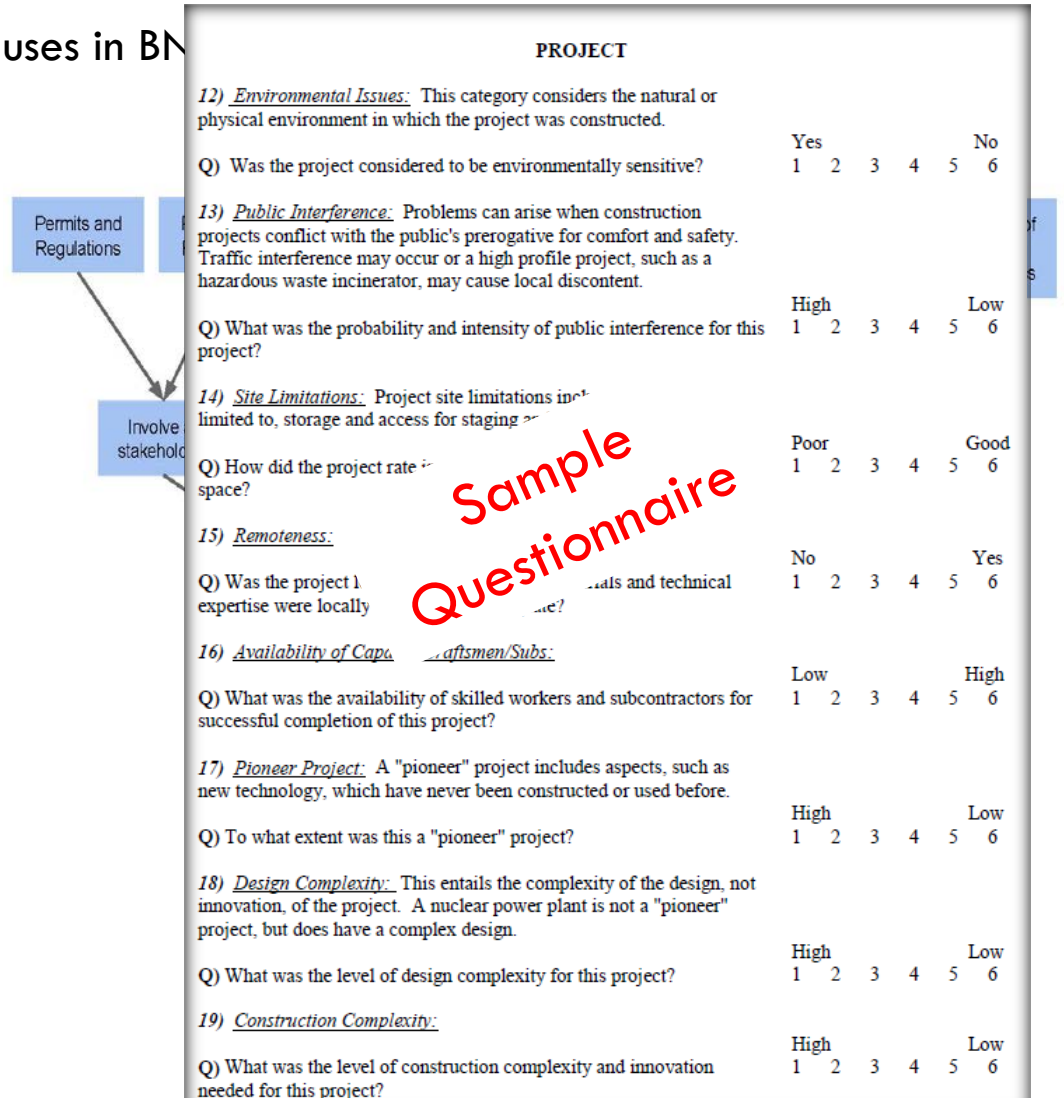
BNN model for main criteria leading to disputes

CII Contract Dispute predictors – BN Model

Remodeling interrelationship of claim causes in BN



CII Branch of Hierarchy



Game Theoretic Parameters

for non-cooperative games

- Players
- Actions & Strategies
- Outcomes & Payoffs
- Timing
- Information
- Prediction (Estimates)

- Timing for Actions
  - Simultaneously -

    Mostly used in axiomatic and Symmetric Information Models
  - Sequentially

    Only if actions can be observed and can influence other player's decision

- Timing also can be considered as factor of duration for negotiation

Image Retrieved from:
http://hercshideaway.blogspot.com/2014/03/mixtape-monday-boxing-tape.html

Game Theoretic Parameters

Information

- Perfect Information
  - Players know the exact Verdict if case goes to trial

- Imperfect Information - Players are not sure about Verdicts
  - Symmetric – (Shared Knowledge)
  - Asymmetric– (Private Knowledge)
    - One-sided Asymmetric – One party hold private info about the case
    - Two-sided Asymmetric – both parties hold private info about the case

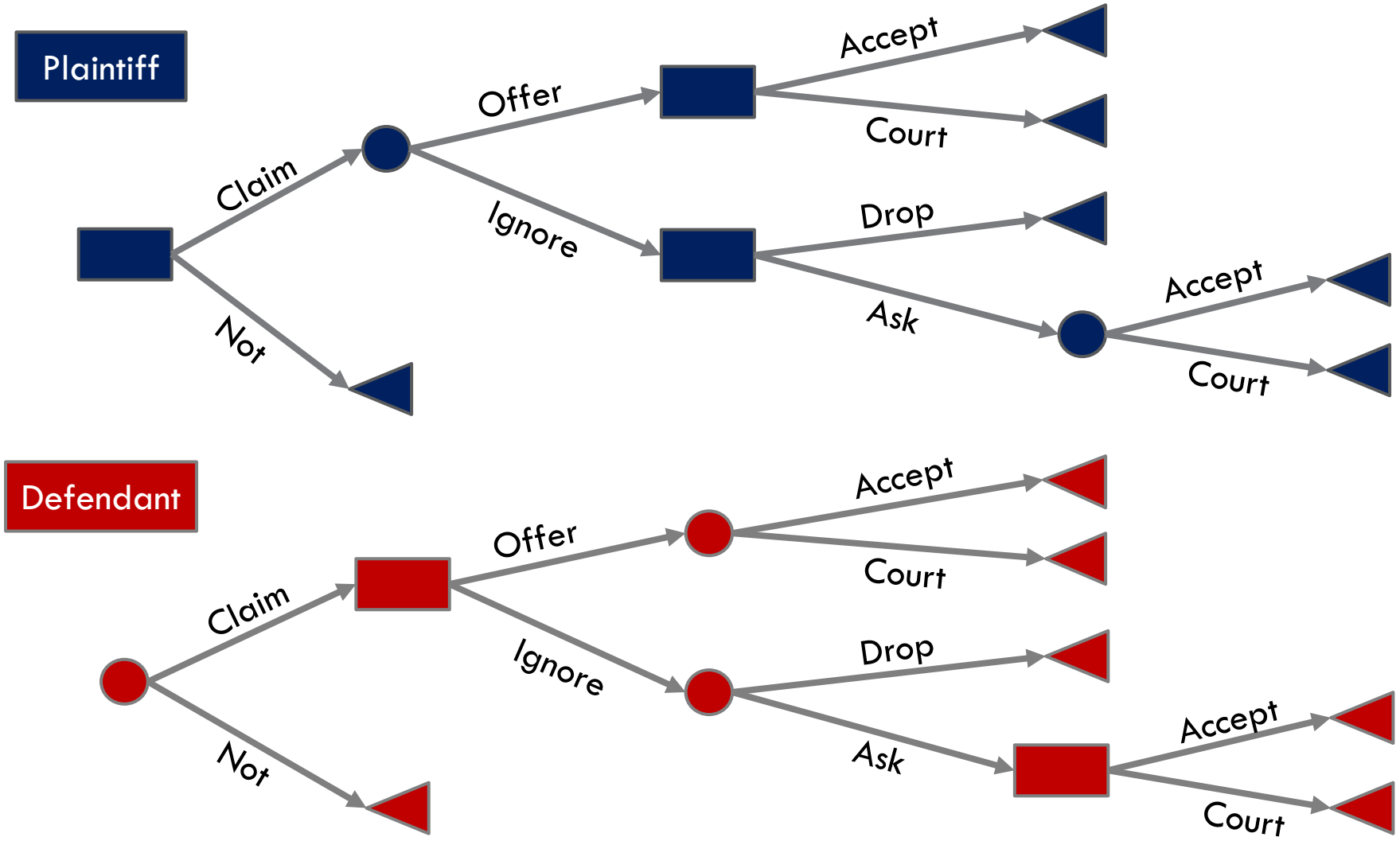
Game Theoretic Parameters

Prediction (Estimates)

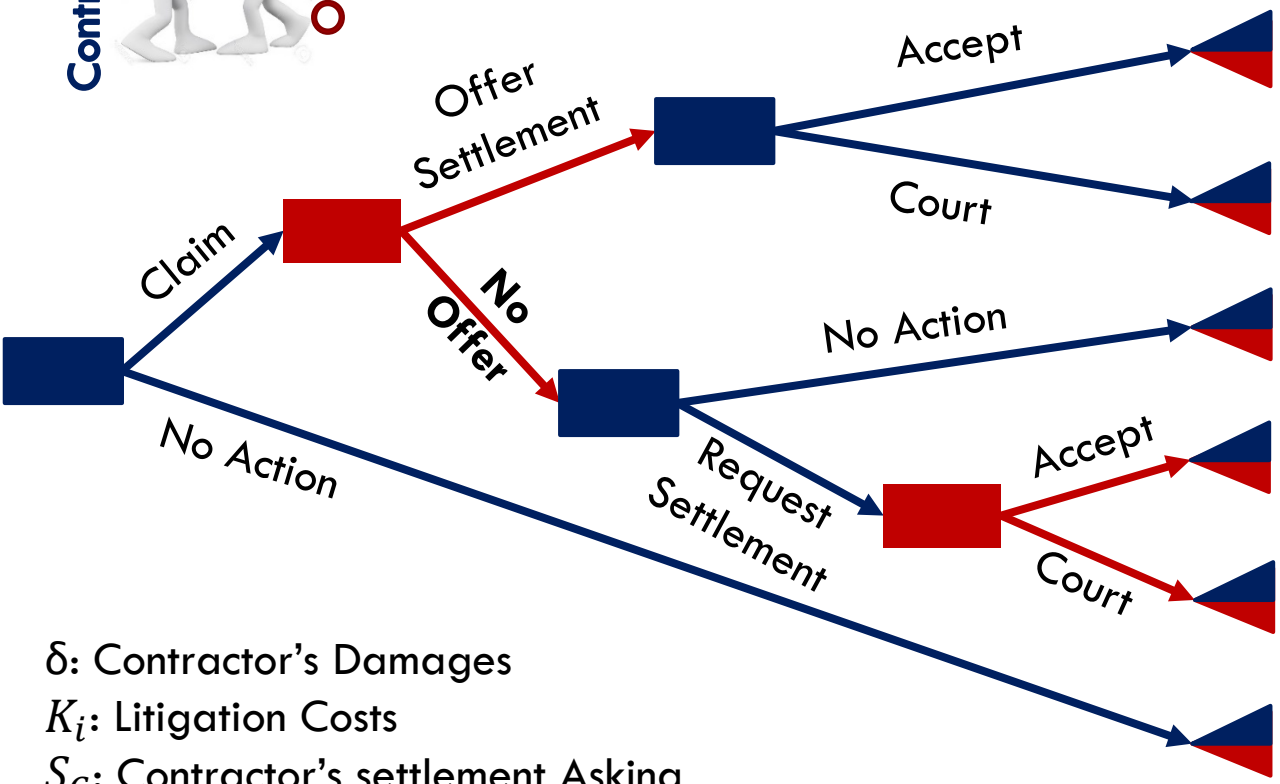
- Cooperative Games
  - Efficient (No money left on the table or wasted like zero-sum game)
  - Equilibrium
    - Nash Bargaining Solution
    - KS Solution

- Non-cooperative
  - Nash Equilibrium — No player can unilaterally improve his payoff by changing strategy
  - Bayesian-Nash — Conditional probability on expected payoffs

Decision Tree for Players' Settlement



Dual Agent Decision Tree for Players



Contractor	Owner
S+O	-
	-V
- δ	0
	-
	0

δ: Contractor's Damages
K_i: Litigation Costs
S_C: Contractor's settlement Asking
S_O: Owner's settlement offer
V: Court's Verdict

Conclusions

- Claim causes can define probability of being held liable by using Bayesian Networks
- Parties acquire private information about claim cases or they may perceive the same information differently
- The belief gap on the amount of damages between claim parties is the base of disputes
- The interaction between parties and measuring the belief gap can be calculated using non-cooperative games for pretrial negotiations (Bayesian Games)
- It is concluded that using Bayesian Network in game theoretic models helps to update parties' belief based on multiple parameters

Questions and Suggestions