Case Study: George Mason University – Men’s Volleyball

Problem:
- George Mason University’s (GMU) top competitor is Penn State University (PSU).
- GMU’s average winning percentage is less than that of PSU’s for the years 2000-2012.
- GMU’s winning percentage variance is greater than that of PSU.
- GMU won 2 out of 26 matches played against PSU (2006-2012).

Need:
- There is a need for a decision-support tool that can identify and quantify sequences of events that can yield at least a 50% winning percentage against Penn State.

Simulation Results
- Monte Carlo Simulation of GMU VS PSU matches.
- Modifying players performance for Attacks, Blocks, Errors and Serves transitions to achieve at least a 50% winning percentage.
- Ranking alternatives based on change required to achieve 50% winning percentage.

Utility Results
- Utility = (0.5) Trainability + (0.5) Modifiability
  - Trainability = (0.5) Efficiency + (0.5) Effectiveness
  - Ease of trainability of the alternatives causes changes to the ranking.

Recommendation
- Lower right quadrant is the most optimal region.
- In terms of risk, the best design alternatives are ranked as follows:
  1. Increasing Attack – Point (Recommendation)
  2. Increasing Block – Point
  3. Decreasing Errors
  4. Increasing Serve - Point

Method of Analysis
- Markov Chain Game Model: Determines the outcome of a volleyball match given the probabilities of transitions between the events shown in the figure (Team A: GMU, Team B: PSU).
- Monte Carlo Simulation of 5000 matches was run 10 times to determine cause and effect relationship between transition probabilities and winning percentage.

**Context**
- Volleyball is a complex game based on a finite but large number of sequence of events (e.g. Serve, Pass, Set, Attack, Block and Point).
- Human decision makers lack the ability to statistically analyze all sequences without the aid of a decision support tool.
- Coaches are under pressure to meet expectations, given the high rate of turnover and the escalating increase in coaches’ salaries.
- Coaches rely on data from matches to make training and recruiting decisions to meet these expectations.

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