

# **How Weapon Systems Are Like Jelly Beans**

*Prediction Markets as Information Aggregation Tool for Effective Project Management in Defense Acquisition Projects*

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NPS

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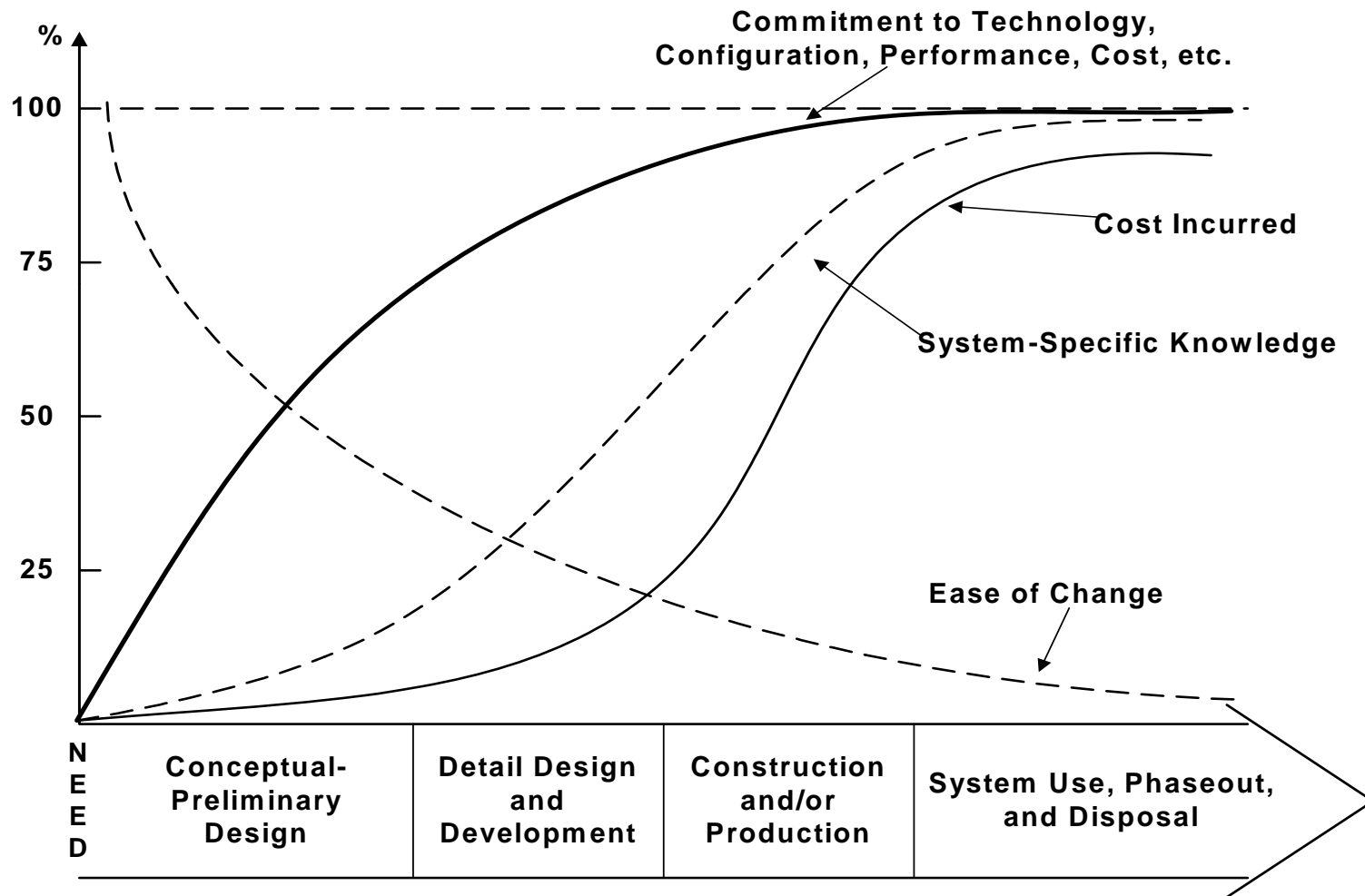
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# Acknowledgements

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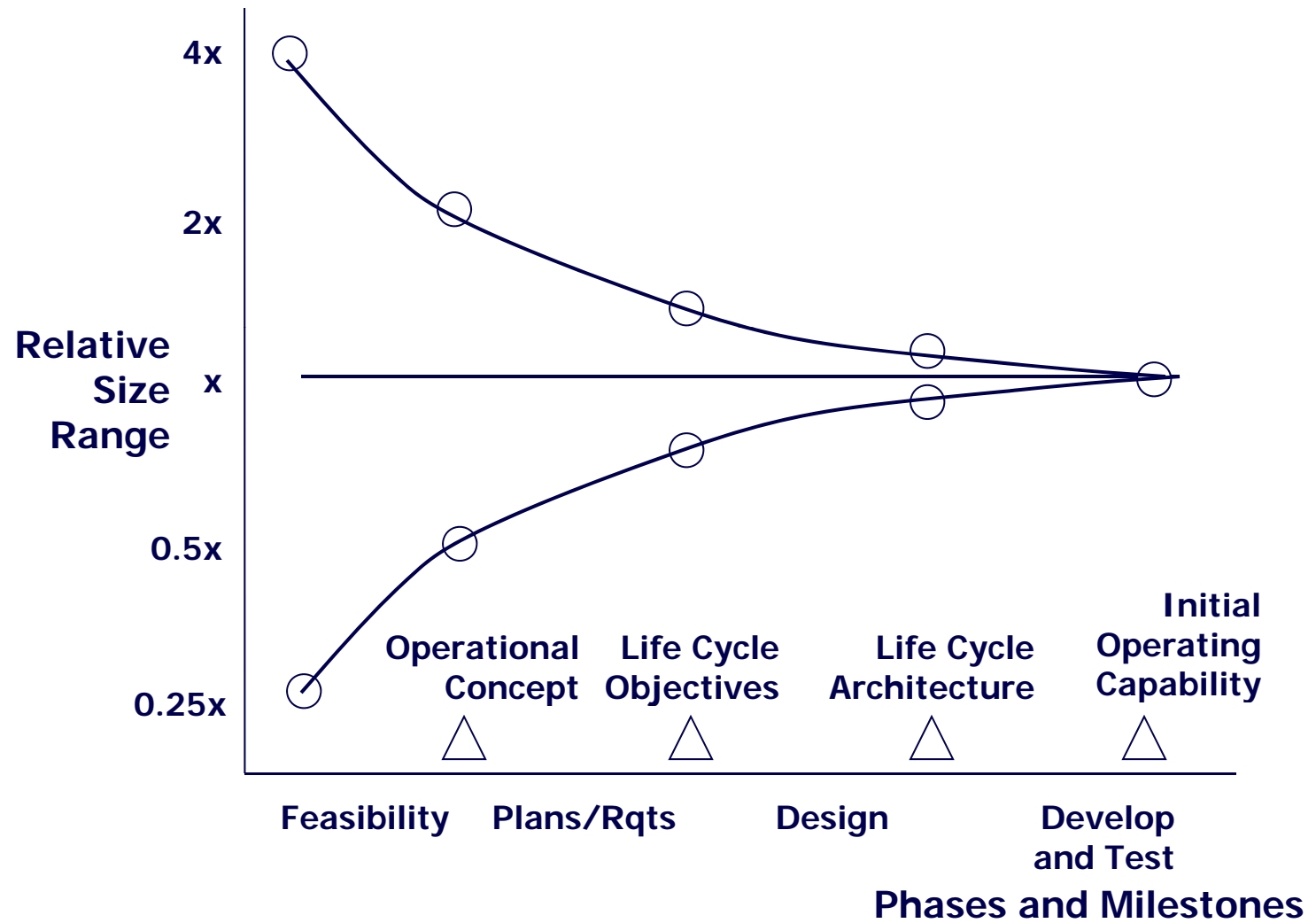
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- Special thanks to MITRE for extending their support and time, and for providing some useful information on prediction markets.
- We wish to thank Adam Siegel of Inkling Markets for his suggestions on prediction market design.

# Cost Commitment on Projects



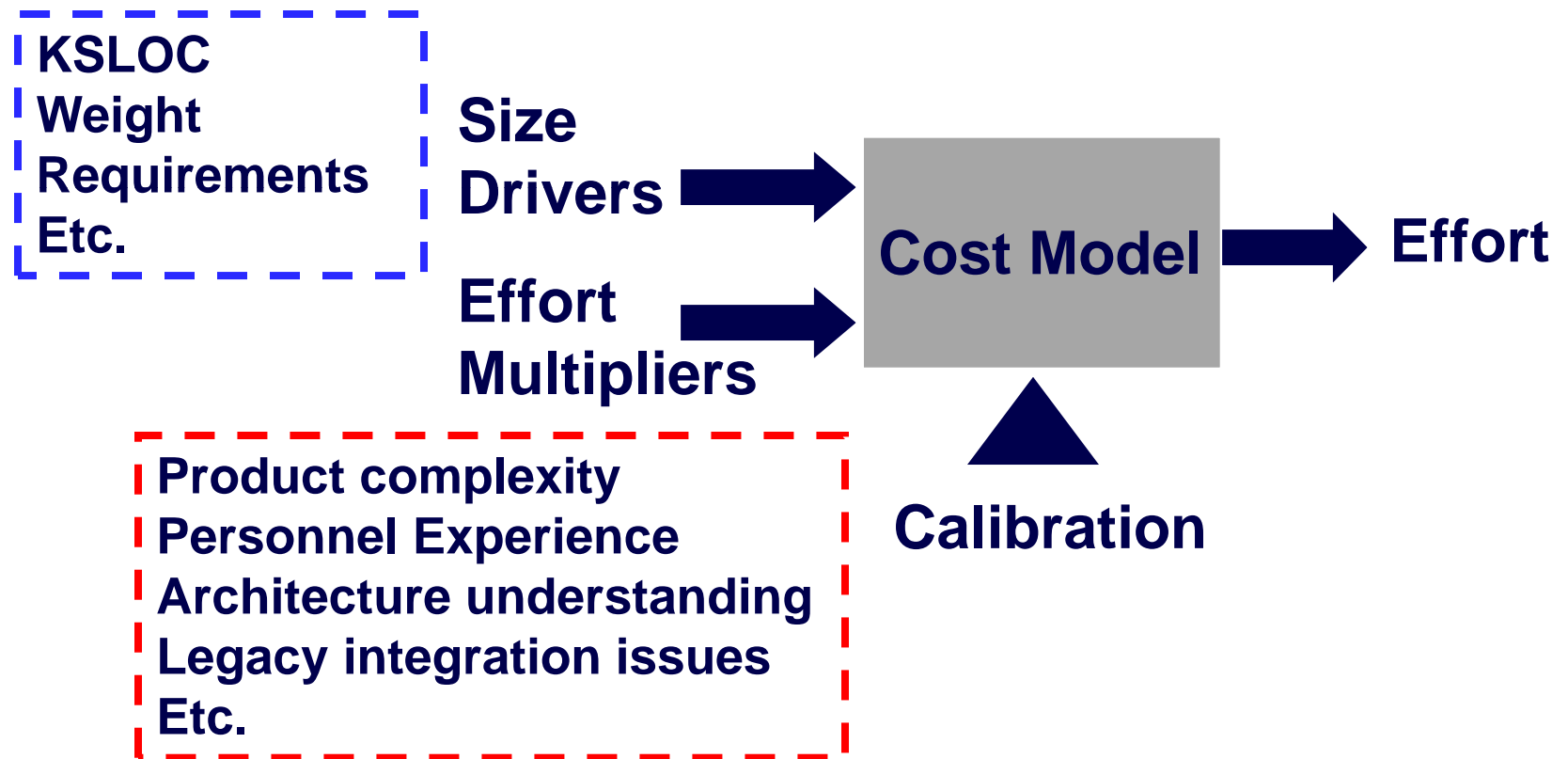
Blanchard, B., Fabrycky, W., *Systems Engineering & Analysis*, Prentice Hall, 1998.

# Cone of Uncertainty

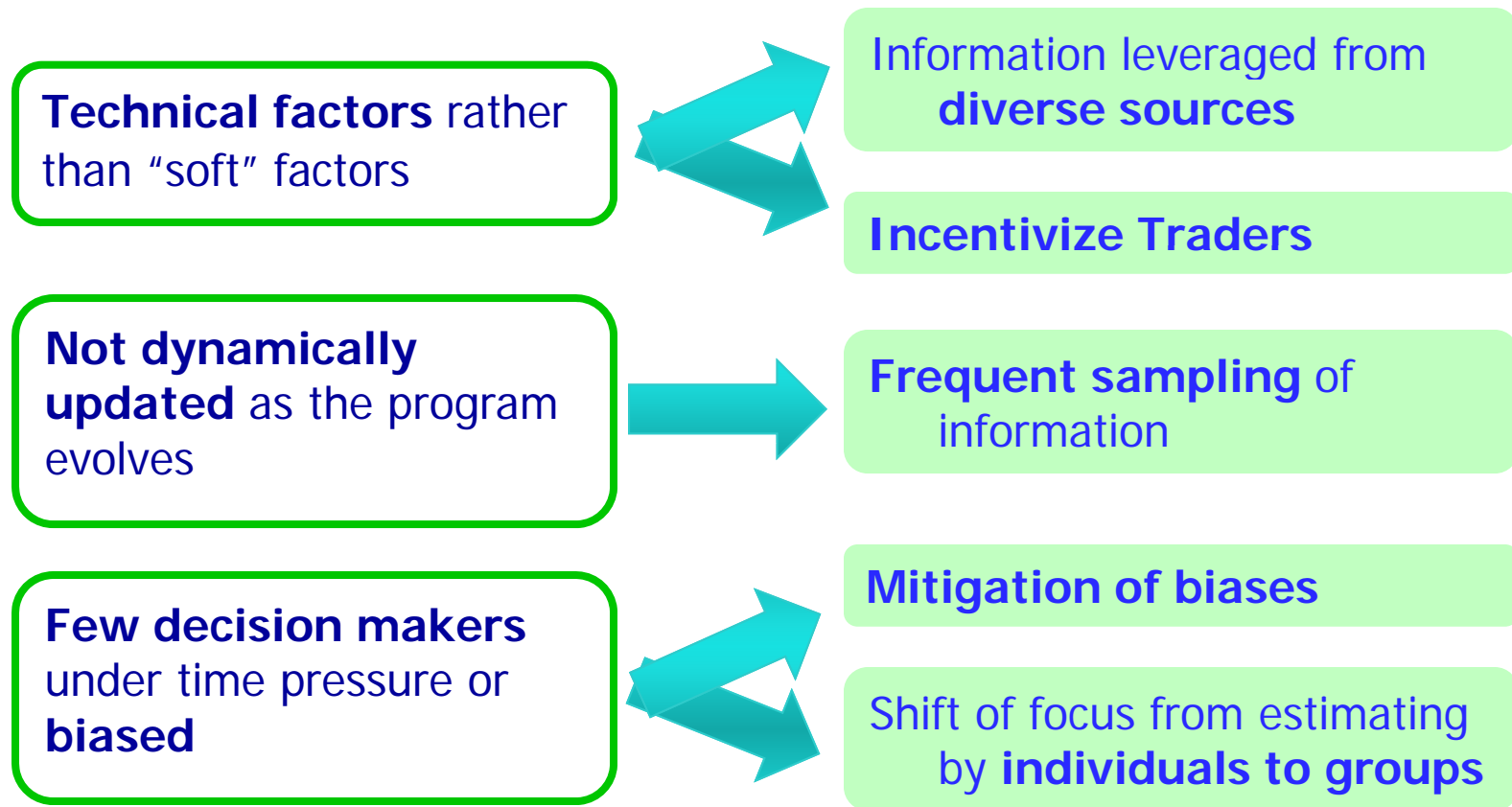


Source: Barry Boehm (USC)

# How Cost Modeling is Done Today



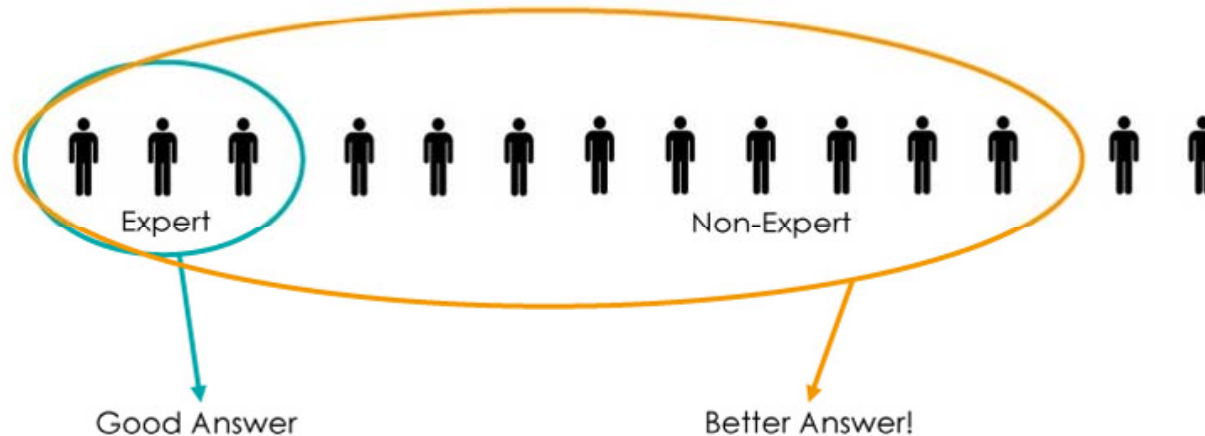
# Prediction Markets: Value Proposition





# Prediction Markets

- A place where people can buy and sell contracts that pay the owner based on some future event

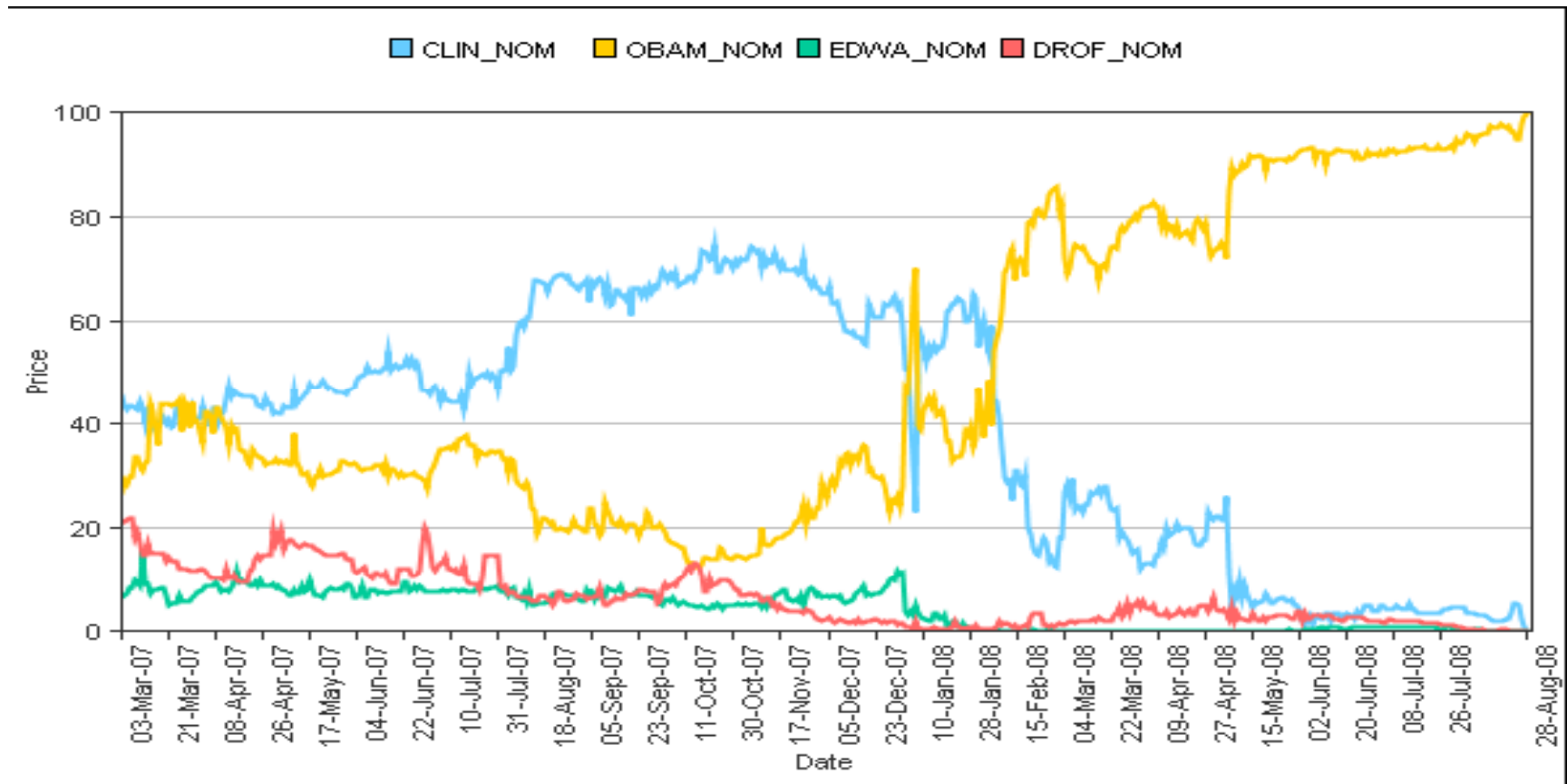




# Example

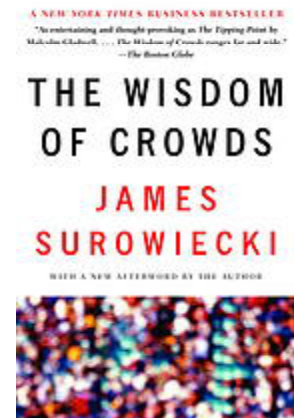
- Iowa Electronic Markets: 2008 Presidential Election
  - Buy and sell shares of candidate votes
  - Contract pays \$0.01 for each percentage point of Obama's vote
  - Contract pays \$1.00 if Obama wins

# 2008 Democratic Nomination Race

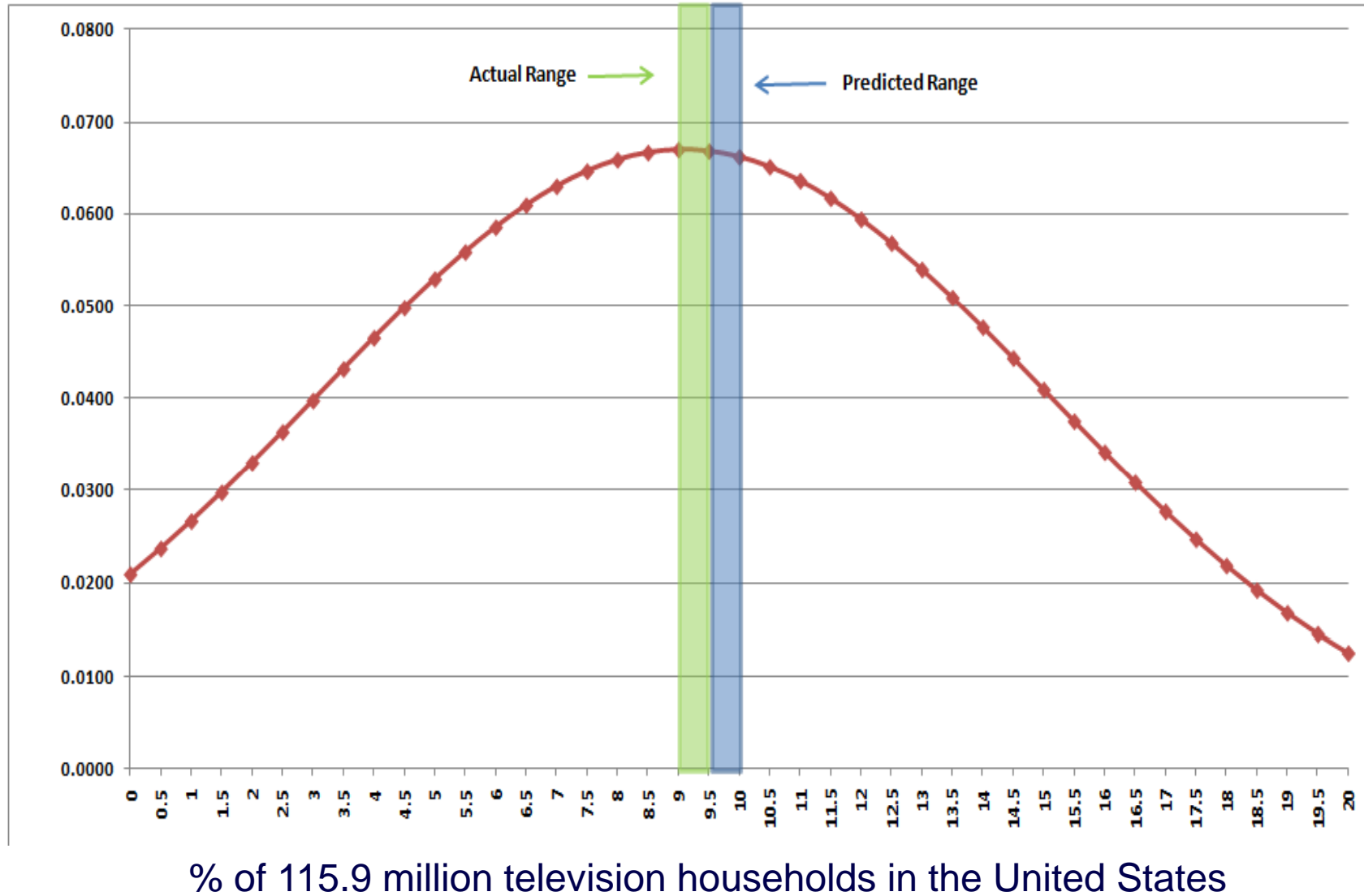


# Hypothesis: prediction markets are “efficient markets”

- Market prediction summarizes traders’ beliefs about what will occur in future
  - Truthful revelation: biased trading gets counter traded (e.g., political trading markets)
  - Information discovery: informed trading is rewarded
- Crowds can be “wise”
  - Diversity, independence, decentralization, aggregation



# Example: Nielsen ratings for Monday night football



# The Case for Prediction Markets

- “First order effects”: information aggregation for accurate prediction
  - Mechanism for bringing together information
  - Incentives for searching out information
  - Incentives for revealing information

# The Case for Prediction Markets

- “Second order effects”: organization culture and communication
  - Signal topics of interest
  - Promote interest and engagement in topics
  - “Flatten” hierarchy
  - Invigorate culture

# Questions PM's can answer: practical guidelines

- “Contractible”: can write a contract about future events with unambiguous and verifiable outcomes
- Outcome categories are mutually exclusive and exhaustive

# Types of Questions

- Bad: "Sales of Xbox consoles will exceed expectations by the end of the year."
- Good: "How many Xbox consoles will be sold between November 1 and December 31, 2010?"



# Using Prediction Markets: Early Lessons

- Problem: “I don’t know how to run a prediction market; it seems hard”
- Remedy:
  - Use Inkling software:  
[www.inklingmarkets.com](http://www.inklingmarkets.com)
  - Market makers are key

# Using Prediction Markets: Early Lessons

- Problem: “Liquidity”: not enough trades and traders
- Remedies:
  - Incentives:
    - Prizes
    - Recognition
  - “Hard” and “Fun” questions
  - Newsletters
  - Senior management involvement

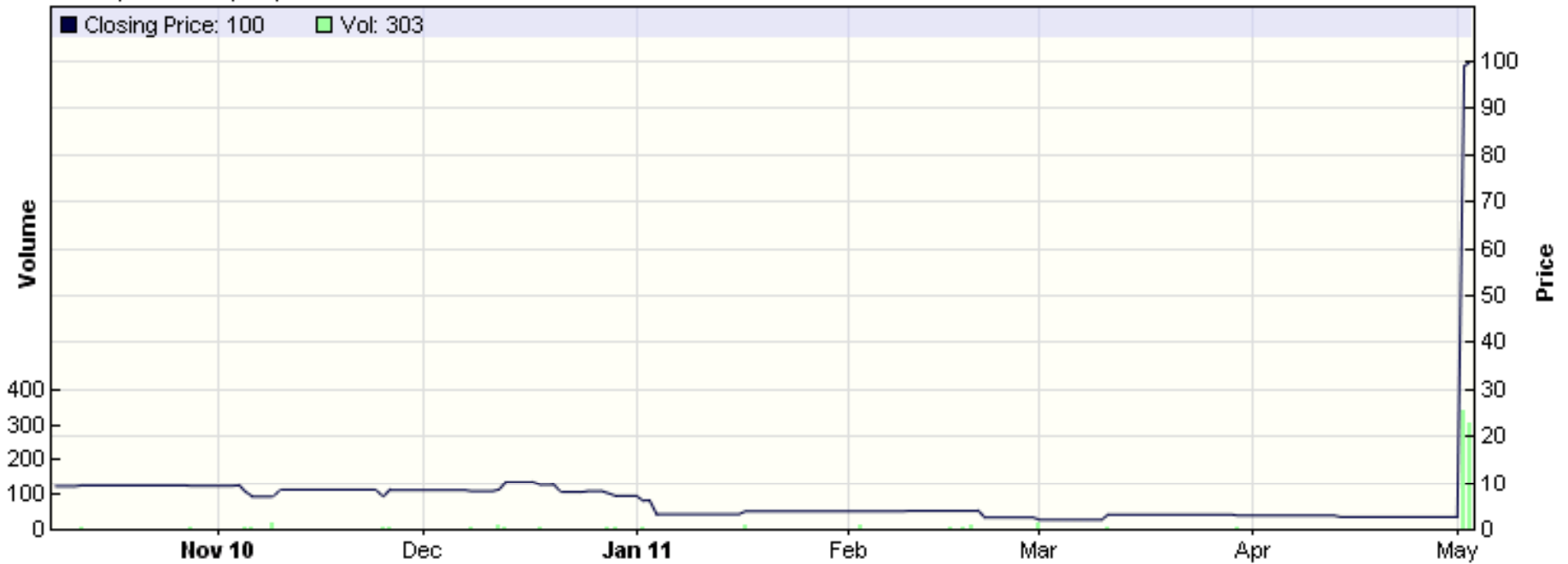
# Using Prediction Markets: Early Lessons

- Problem: “Insider trading”
  - Some traders have/will have inside information
- Remedies:
  - Change questions
  - Change trading window
  - Restrict trading access to “insiders”

# Osama Bin Laden to be captured/neutralized before midnight ET on 30 Jun 2011

## OSAMA.CAPTURE.JUN11

Oct 08, 2010 - May 02, 2011



Source: [www.intrade.com](http://www.intrade.com) ©

# Prediction Markets: Case Study - SWCS

## Design Components to consider

Stocks

Marketplace

Traders



**Shallow Water Combat Submersible**

Implement prediction markets to surface potential program risks, and generate cost/schedule estimates as a supplement to existing estimation methodologies

# Prediction Markets: Benefits to SWCS

**Benefit from the prediction markets event forecasts.**

**Increased involvement of the participants in anticipating events.**

**Identifying informal information channels in their organization.**

**Continuous review of factors impacting cost and schedule**

**Agility**

**Efficiency**

**Transparency**

# Prediction Market Design

## First Order Questions: Program of interest

- Will SWCS be certified by August 1, 2012?
- The cost of the first unit will be \$x.

## Second Order Questions: Traders and the trading process

- Who has information about the program (who makes money in the market?)
- Where did they learn this information?
- What is your motivation for trading? (e.g. to win/to solve the problem/to validate my knowledge)

## Third Order Questions: Behavior outside the markets

- Did prediction market participation increase team knowledge, collaboration and information sharing?
- Did it outperform a cost model in terms of agility, transparency, sensitivity to events?

# Prediction Market Design Principles

**Sufficiently broad following**

**Incentives based on constant participation and ability to predict accurate results**

**Ample historical data**

**Mix of hard and fun questions**

**Anonymity of participants, information security/confidentiality**



