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Tensions Between Experiential and Technical Approaches to Inspection

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The Problem

- Sometimes an inspection issue has a *quantitative* answer at odds with front-line convention
- We can demonstrate the answer and the reason(s) why
- But, that may or may not convince the skeptics

Overview

- Example of differing contentions about reducing inspections
- Show simulation results with a clear “winner”
- Consider how to overcome doubts
  - What are the sources of doubt?
  - How do we make technical explanations more convincing and effective?

Risk-Based Sampling

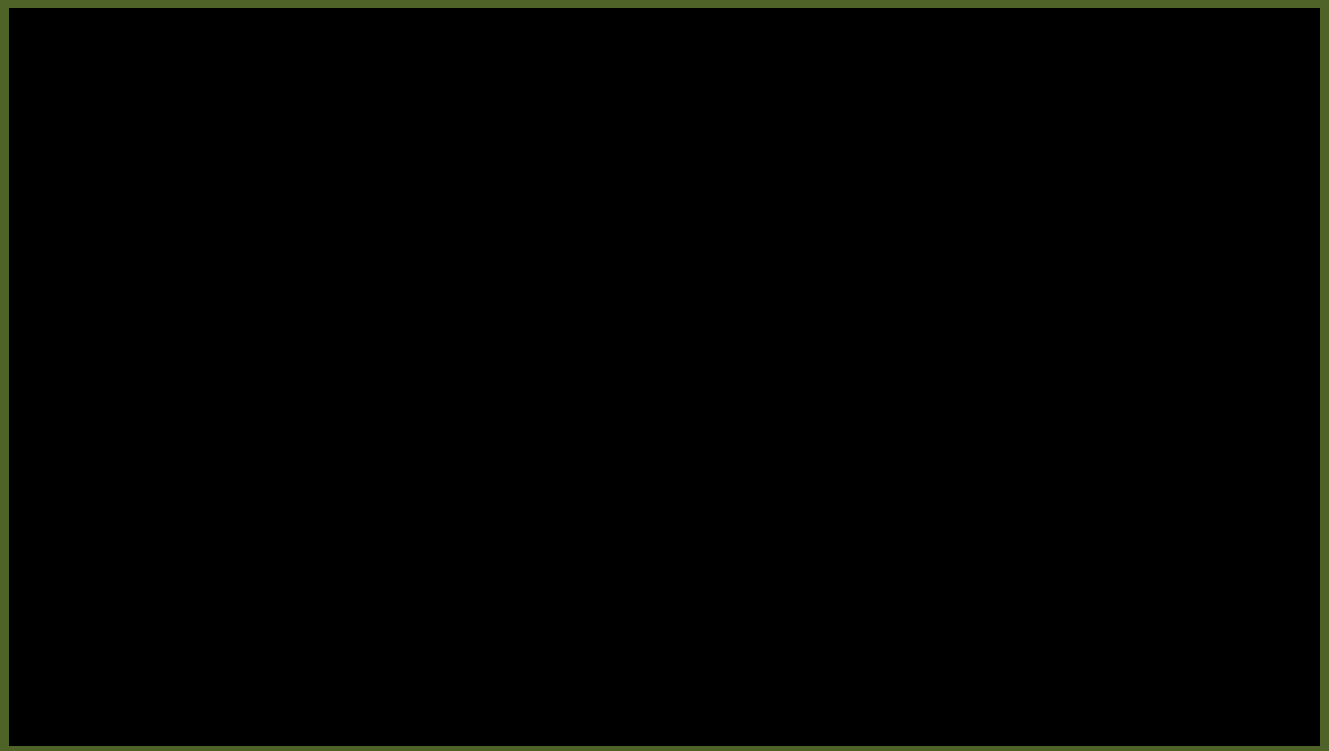
- General goals
  - Fewer inspections of low risk material
  - Find more pests overall
  - Create incentives for sending pest-free material

- In baseball terms…
  - Willie Keeler said, “Hit it where they ain’t.”
  - RBS says, “Don’t inspect where they ain’t.”

Example Issue

- How to reduce inspections?
  - Lower intensity = same frequency but fewer samples per consignment
  - Lower frequency = same intensity but fewer consignments
- Why do we care?
  - Technical reasons
  - Front-line comment: Clearances are “pests walking out the door”

“Moneyball”: Sports and Analytics



- “It’s not science. …They don’t know what we know.”

Contrasting Viewpoints

- Experiential
  - Ethic: Try to find *every* pest
  - Any inspection > None
  - Can find the very few pests that may be present
- Technical
  - Ethic: Minor leakage is acceptable
  - Low risk items = spend as little time as possible
  - Many such consignments may have **zero** pests
  - Avoid “haystack needle” inspections
  - Give inspectors the best chance to find pests

Example Issue: Low Risk Items

- Contentions
  - Experiential: “Inspect no fewer than 2 samples”
  - Technical: “Lower frequency at the standard sampling intensity is better”

- Note
  - The experiential viewpoint has value
  - But the probabilities are stacked against them

Simulated Inspection Game

- Comparison
  - Scenario 1: Lower intensity
    - Consignment inspection = 100 percent
    - Samples taken = 2
  - Scenario 2: Lower frequency
    - Consignment inspection = 10 percent
    - Samples taken = 20
  - Mean = 20 boxes per 10 consignments

Rules of the Game

- Infestation rate = 0.0001 (1/10,000)
- Same specifications/assumptions
  - Consignment size and make up, inspection efficiency, no clumping
  - 100,000 iterations
- Compare effectiveness
  - Infestation detection rate
  - Likelihood of selecting infested sample
  - Leakage = Missed infested units

Results 1: Low Risk Items

Approach	Mean Detection Rate (no.)	Mean Leakage (units)	Mean *p*(selection)
p = 1.0, Boxes = 2	0.0098	0.238	0.010
p = 0.1, Boxes = 20	0.0098	0.238	0.100

- Result = No difference in safeguarding
- Runs counter to Experiential Viewpoint

Results 2: Time required

- Per consignment
  - Paperwork = no difference
  - Box pulling/sample inspection = no difference
  - Consignment handling = difference
    - Unpacking and repacking, sampling tool operation
- Time savings in this case
  - Hours saved ≈ 23 (function of handling time)
  - Additional boxes/consignment = 4 (function of inspection time)

Use Freed-Up Resources in Game

- Increase sampling for High Risk items
  - From 20 to 24 boxes per consignment
  - *Note*: only a moderate (20%) increase
- Infestation rate = 0.001 (1/1000)
  - *Note*: Also a moderate assumption
- Same specifications etc.

Results 3: High Risk Items

Sampling	Mn Detection Rate (no.)	Mn Leakage (units)	Consignments per Unit Leaked
20 Boxes	0.745	0.224	4.5
24 Boxes	0.803	0.125	8.0

- Result = *better* safeguarding of High Risk items with lower frequency option

‘Inspection game’ conclusions

Result	Lower intensity	Lower frequency
Safeguarding: Low Risk Items		
Consignment Handling Time		
Safeguarding: High Risk Items		

- Basic RBS theory affirmed
  - Minimize time spent on Low Risk items
  - Transfer inspections to High Risk items

Discussion

- Limits of experience
- Why is there doubt?
- Overcoming doubt

Perception is Difficult

- "One absolutely cannot tell, by watching, the difference between a .300 hitter and a .275 hitter. The difference is one hit every two weeks."

  Michael Lewis, "Moneyball"

- For weekly consignments, the difference between 0.01 and 0.005 action rates is 1 detection every two years

Reasons for doubt?

- Resistance to change
- Technical
  - Don’t trust ratings data/process (!)
  - Don’t believe differences exist
  - Don’t believe model results
- Programmatic
  - Suspicious of motives (↓ positions or overtime)
  - Dislike reduced autonomy
  - Dislike not trying to find *every* pest

Overcoming Doubt

- Outreach and education
  - Best efforts to explain and illuminate
  - Theory (numbers) > Practice (program)
- Implementation
  - “Show me” types may doubt until they can experience it
  - Practice > Theory
- Note: I don’t have answers, just some possible solutions

Outreach Considerations

- Learning materials
  - Multiple formats
  - Relatable + practical
  - Hands-on?
  - Address a single issue at a time
  - Interactive
  - Take requests; be responsive
- Strategy
  - Consider reasons for doubt (technical/programmatic)
  - Use credible staff/specially trained front-line personnel
  - Mix of management levels
  - Target influencers

Implementation Considerations

- Avoid completely top-down approach
  - Without buy-in, motivation could be low
  - Highlight dependence on inspection results
  - Augment role if possible
- Manage expectations
  - Anticipate problems; Adjust and move forward
  - Interceptions should increase, *ultimately*, but over the short term…
- Outcomes
  - Before/after effort and effectiveness metrics
  - Stakeholder responses; Effects on “dirty” shippers

Final Thoughts (1/2)

- Overcoming doubt
  - Important to recognize the reasons for it
  - Outreach: Simple, practical, responsive
  - Implementation
    - Try to augment role of front line
    - Manage expectations
    - Ultimate—not first—solution

Final Thoughts (2/2)

- Baseball and inspections are, to a great extent, both *numbers games*
  - Managers/Analysts: Answers exist, but don't get too cocky about them
  - Scouts/Inspectors: Experience matters, but don't completely discount theory
  - If the goal is better safeguarding

  …the Technical and Experiential sides need each other