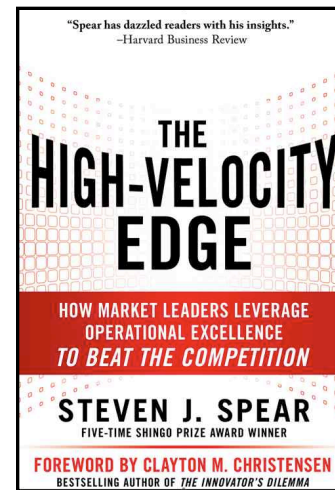


# Anomalies or Leading Indicators: System Failures and What to Do About Them

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# Objective

- Share hypothesis...
- Get feedback from you.



# Hypothesis

- Systems have gone from ‘simple’ and ‘stable’ to ‘complex’ and ‘dynamic’ (fast moving)
- Requires different approach to management.
  - More compartmentalization
  - Lower threshold, more frequent checks



# Key Points

- **Multiplicity of Failures across sectors**
- **Alternative explanations**
- **Appropriate Responses**
- **Question and Answer**



# Multiplicity of Failures

- IT
  - Citi, Lockheed Martin, Sony, IMF, PBS
- Natural Resources
  - BP
  - Upper Big Branch Coal Mine
- Toyota



# Anomaly or Leading Indicator

Multiplicity of Failures  
**Alternative explanations**  
Appropriate Responses  
Q+A

Anomalous experience...

...needs technical fix.

‘Leading indicator’ ...

...needs managerial fix.



# Anomaly or Leading Indicator

Multiplicity of Failures  
**Alternative explanations**  
Appropriate Responses  
Q+A

“Bolt out of the Blue”

- The system was the same system as before
- The way we managed the system was the same as before.
- Failure was unforeseen *and* unforeseeable.



# Anomaly or Leading Indicator

Multiplicity of Failures  
**Alternative explanations**  
Appropriate Responses  
Q+A

The system was *different* than ever more.

- More ‘people’ and specialties involved.
- More organizations represented.
- More and novel materials.
- More and novel processes.

Things were more complex than ever before.





# Anomaly or Leading Indicator

Multiplicity of Failures  
**Alternative explanations**  
Appropriate Responses  
Q+A

Challenge of complexity

More ‘elements’ connected via more linkages than ever before.

- Hard to ‘see’ structure.
- Hard to predict behavior.



# Anomaly or Leading Indicator

Multiplicity of Failures  
**Alternative explanations**  
Appropriate Responses  
Q+A

Complexity: examples

- Autos
- Natural resources
- IT



# Appropriate Responses

*For simple, stable...*

Structure... easy to visualize...

Situations... developed slowly.

...we could treat aberrations as ‘noise’ to high thresholds.



# Appropriate Responses

For complex, dynamic,

Structure...hard to imagine.

Dynamics...hard to keep up.



# Appropriate Responses

## Compartmentalization

-- see the pieces and how the pieces relate.

High speed, low threshold diagnosis.



Multiplicity of Failures  
Alternative explanations  
Appropriate Responses  
**Q+A**

# Discussion

- What do you think?????



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