[Private]

Supply Chain Risk

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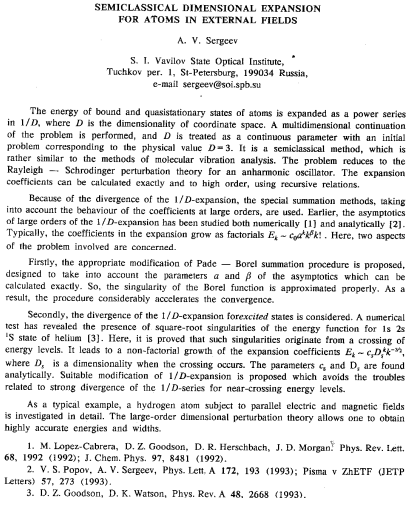
Overview

- Our Methodology
- Key Findings
- Regulatory Trends
- Appendix: Early Warnings

Our Methodology

Computer Science



SEMICLASSICAL DIMENSIONAL EXPANSION
FOR ATOMS IN EXTERNAL FIELDS

A. V. Sergeev

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The energy of bound and quasistationary states of atoms is expanded as a power series in $1/D$, where D is the dimensionality of coordinate space. A multidimensional continuation of the problem is performed, and D is treated as a continuous parameter with an initial problem corresponding to the physical value $D = 3$. It is a semiclassical method, which is rather similar to the methods of molecular vibration analysis. The problem reduces to the Rayleigh — Schrodinger perturbation theory for an anharmonic oscillator. The expansion coefficients can be calculated exactly and to high order, using recursive relations.

Because of the divergence of the $1/D$-expansion, the special summation methods, taking into account the behaviour of the coefficients at large orders, are used. Earlier, the asymptotics of large orders of the $1/D$-expansion has been studied both numerically [1] and analytically [2]. Typically, the coefficients in the expansion grow as factorials $E_k \sim c_0 a^k k^b k!$. Here, two aspects of the problem involved are concerned.

Firstly, the appropriate modification of Pade — Borel summation procedure is proposed, designed to take into account the parameters a and β of the asymptotics which can be calculated exactly. So, the singularity of the Borel function is approximated properly. As a result, the procedure considerably accelerates the convergence.

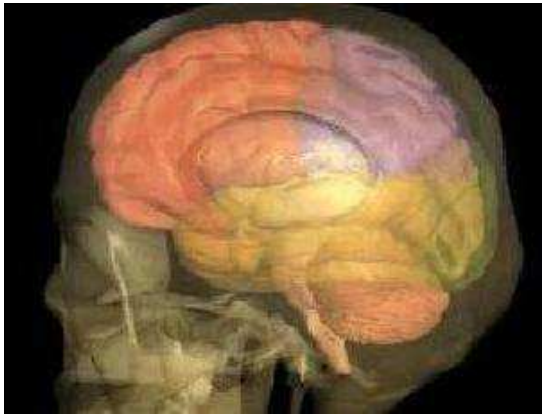
Secondly, the divergence of the $1/D$-expansion for *excited* states is considered. A numerical test has revealed the presence of square-root singularities of the energy function for 1s 2s ^1S state of helium [3]. Here, it is proved that such singularities originate from a crossing of energy levels. It leads to a non-factorial growth of the expansion coefficients $E_k \sim c_s D_s^k k^{-5/2}$, where D_s is a dimensionality when the crossing occurs. The parameters c_s and D_s are found analytically. Suitable modification of $1/D$-expansion is proposed which avoids the troubles related to strong divergence of the $1/D$-series for near-crossing energy levels.

As a typical example, a hydrogen atom subject to parallel electric and magnetic fields is investigated in detail. The large-order dimensional perturbation theory allows one to obtain highly accurate energies and widths.

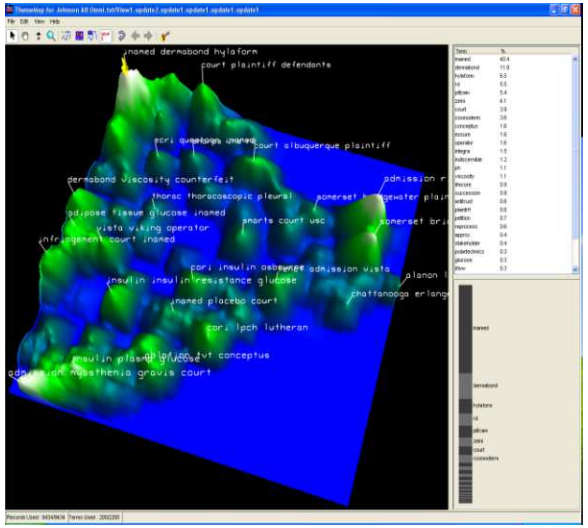
1. M. Lopez-Cabrera, D. Z. Goodson, D. R. Herschbach, J. D. Morgan, Phys. Rev. Lett. 68, 1992 (1992); J. Chem. Phys. 97, 8481 (1992).
2. V. S. Popov, A. V. Sergeev, Phys. Lett. A 172, 193 (1993); Pisma v ZhETF (JETP Letters) 57, 273 (1993).
3. D. Z. Goodson, D. K. Watson, Phys. Rev. A 48, 2668 (1993).

- News
- Web
- Reports

Neuroscience



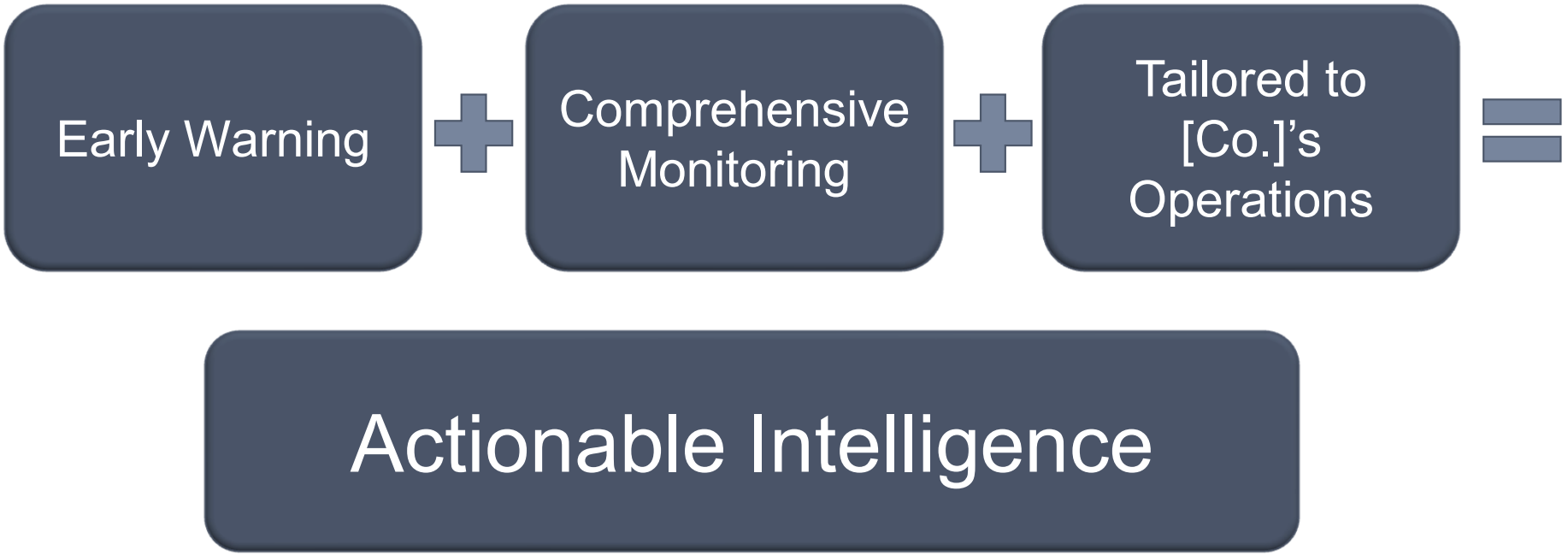
- Beliefs
- Emotions
- Actions



- Text Analytics
- Affect Engines
- Risk Identification

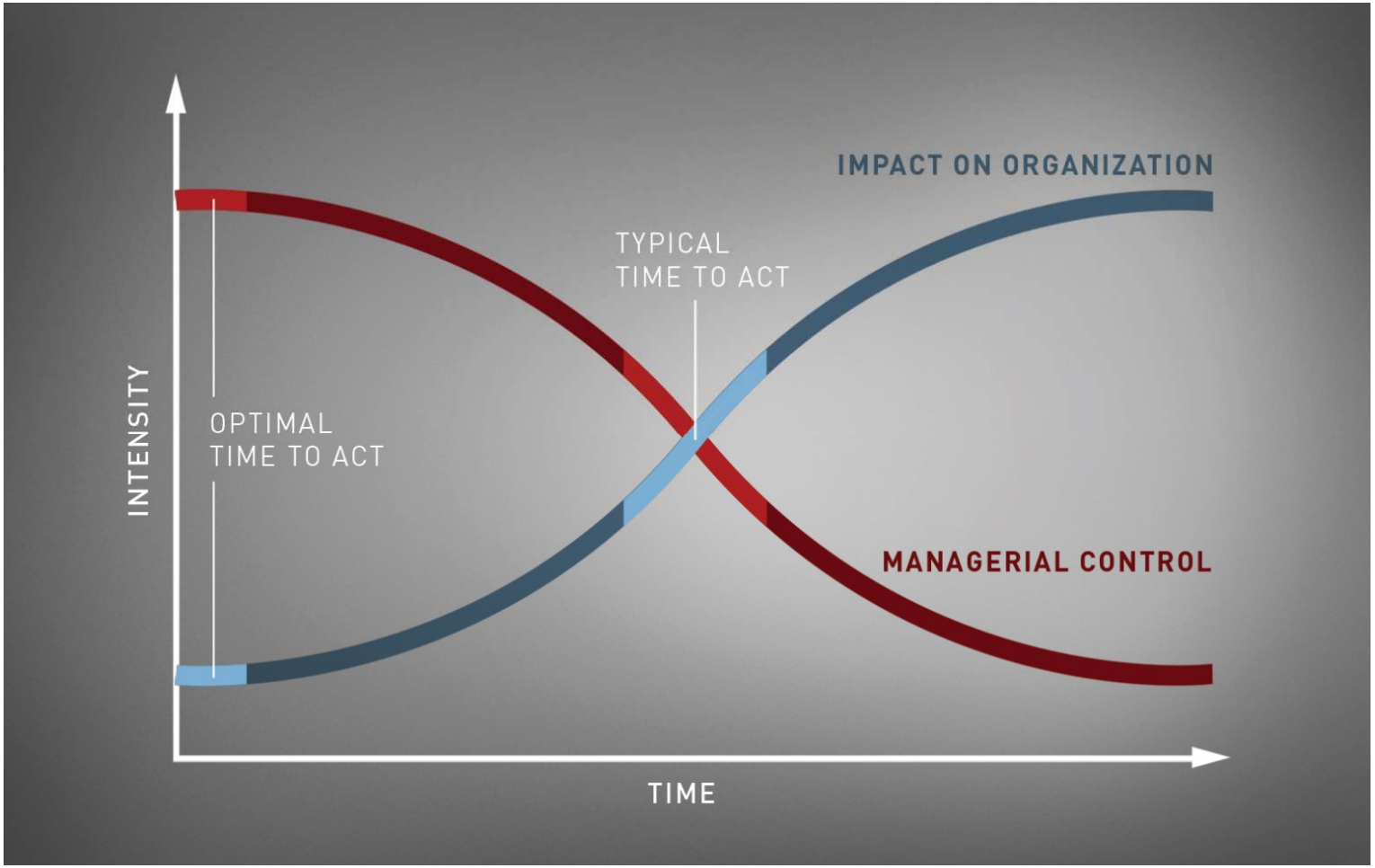
Our Methodology

- **Uncovering relevant but unknown issues**



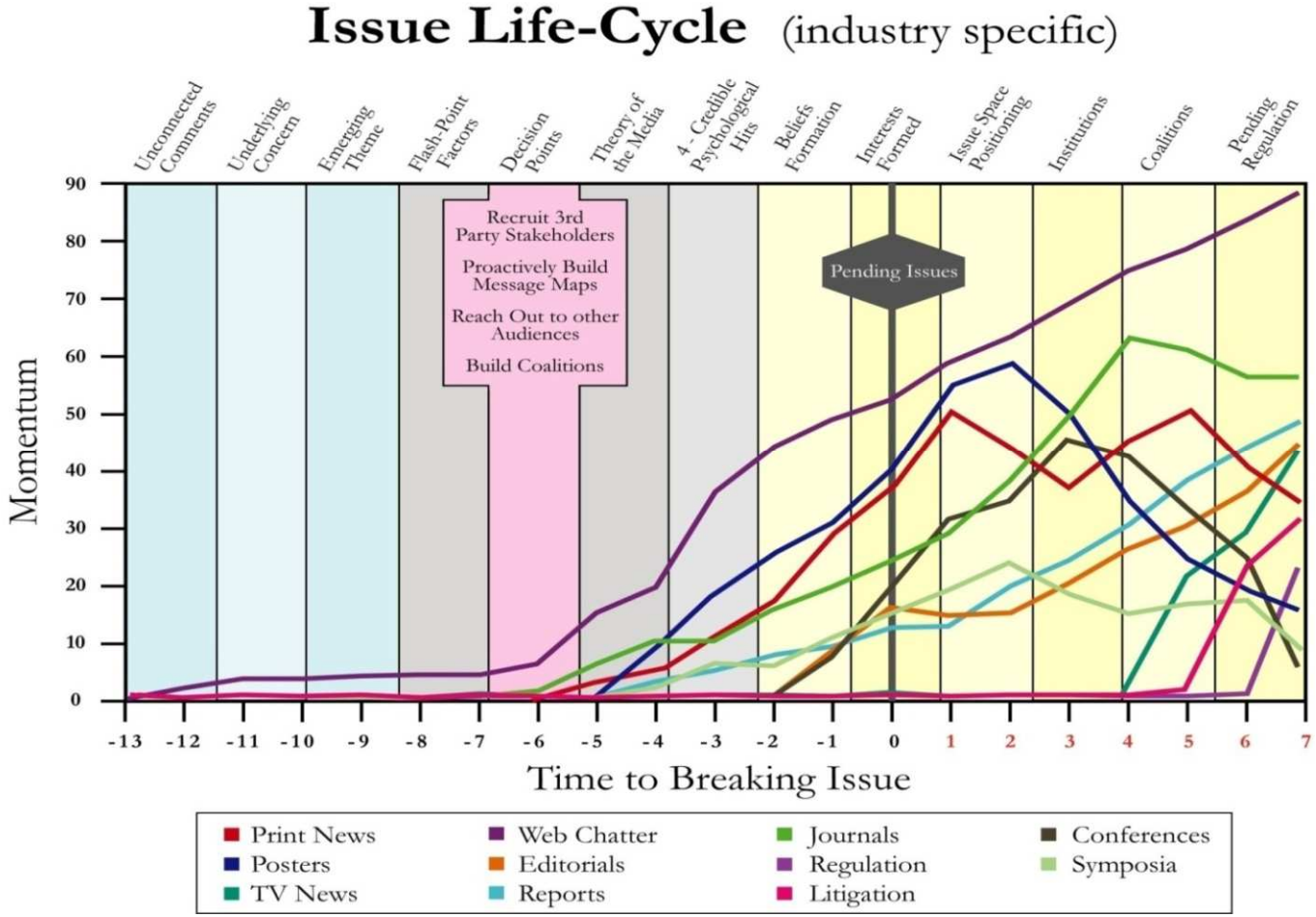
Our Methodology: Early Warning

- **Early warning**
  - Maximizes managerial control in mitigating potential crises
  - Minimizes impact on [Co.] by preempting crisis development



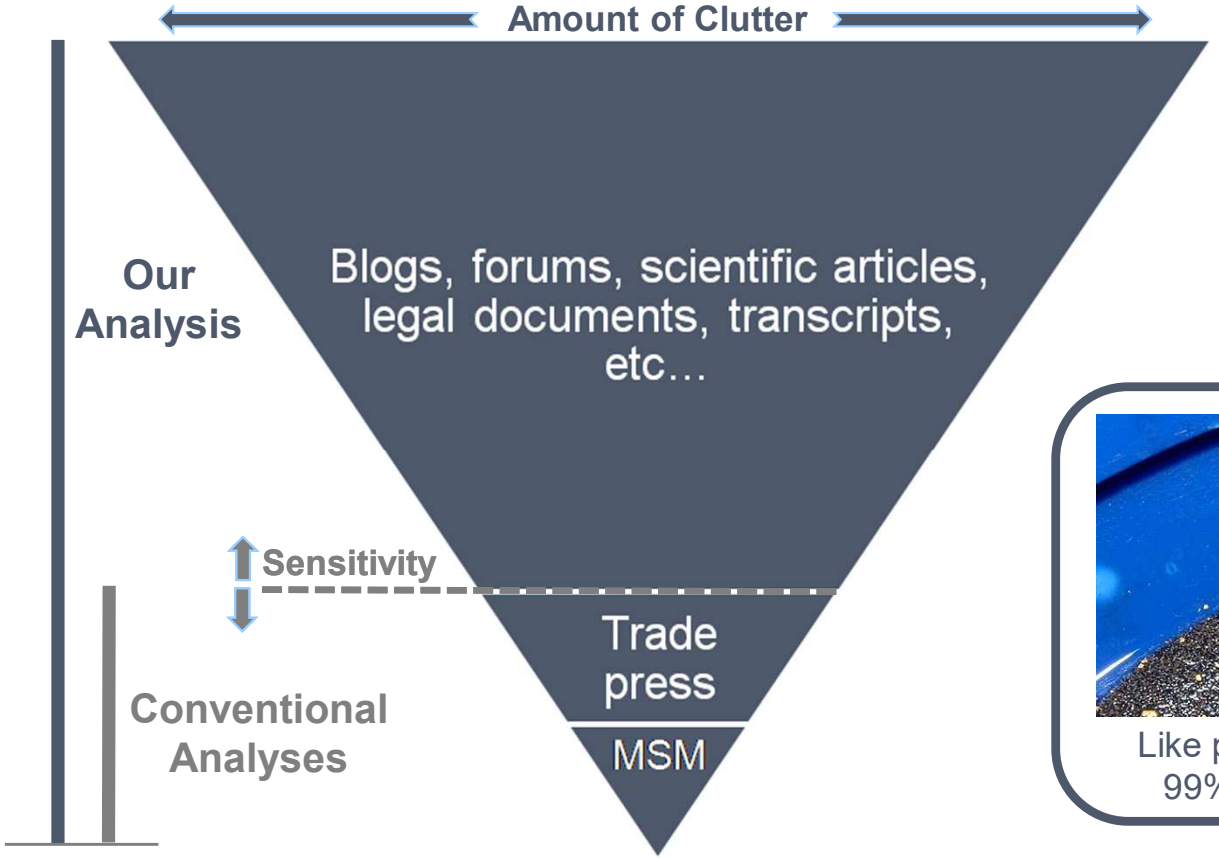
Our Methodology: Early Warning

- **Why monitor grassroots media?**
  - Provides a significant lead time on mainstream media reporting
  - E.g. Disgruntled workers post online about poor conditions months before mainstream media reports a sabotaged factory



MT26 Our Methodology: Comprehensive monitoring

- **Ideal scenario is to monitor "everything" (maximum sensitivity)**
  - But, humans have limited time and attention
  - High sensitivity (high rejection threshold) brings clutter
  - We filter through this clutter to find early warnings from unlikely sources



Like panning for gold, we sift through 99% noise to find relevant signals

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Slide 7

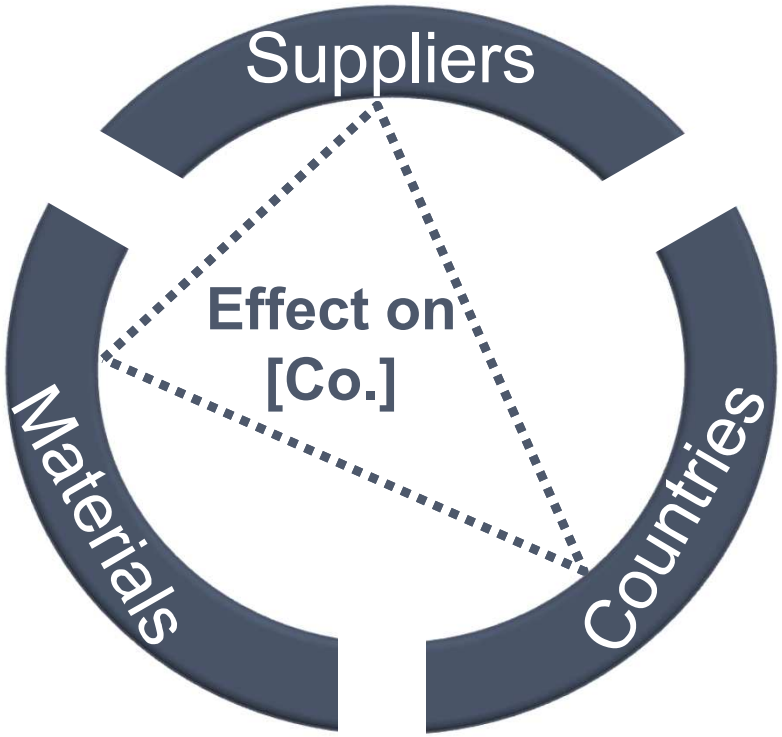
MT26 This is very good

Mathieu Trepanier, 5/12/2009

Our Methodology: Tailored to [Co.]'s operations

MT27

- **Mainstream media and trade press report new information using old frameworks**
  - This is important information, but not intelligence
- **Need to draw Lateral Connections**
  - Interconnections between supplier, material, and country issues



"When One tugs at a single thing in Nature, he finds it attached to the rest of the world."

-John Muir

Slide 8

MT27 Think about a way to change the title (same for slide 4). Instead of "Tailored to Abbott's operations", perhaps something like "holistic perspective" or...

Mathieu Trepanier, 5/12/2009

Examples of key indicators by target

Our Methodology: Comprehensive monitoring

- **Time period and sources surveyed**

Overview

Our Methodology

Key Findings

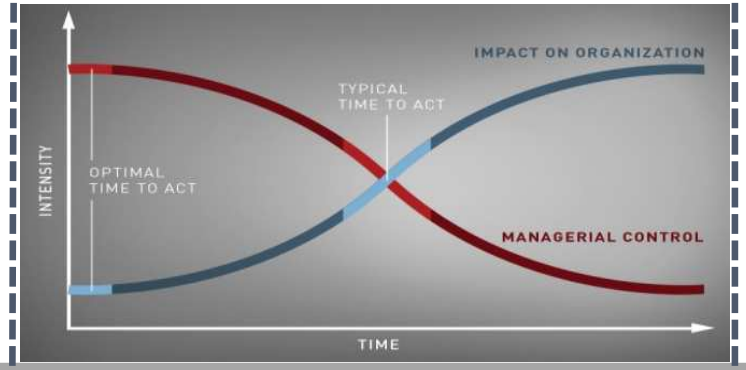
Regulatory Trends

Appendix: Early Warnings

MT40

Key Finding: Talcum powder

- **German company, NUK, finds that baby powder product is tainted with asbestos** MT28
  - Product made by Duksan in Korean factory, but talc was imported from China
  - Regulators quickly turn a critical eye to talc safety, including Chinese suppliers
    - E.g. [Co.] supplier, Guangxi Longguang Talc Development Co. MT29
    - [Co.] questioned about the safety of their talc sources MT30
  - A complex issue with explosive potential, requiring proactive action
    - Regulators are necessarily reactive, so a firm can win on speed



Early warning gives flexibility to ensure compliance and shape your message before the issue goes public

April

Alert sent to [Co.] 04/03/09

Issue breaks in media 04/09/09

Korean media requests disclosure 04/13/09

GPO Ludwigshafen investigates 04/15/09

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Slide 12

MT28 Change "turn a critical eye" to something like "increased scrutiny"
Mathieu Trepanier, 5/12/2009

MT29 The example is not clear enough. Was there an incident with this supplier?
Mathieu Trepanier, 5/12/2009

MT30 Could be changed to something like "Abbott faced media inquiry..."
Mathieu Trepanier, 5/12/2009

MT40 We need to emphasize the actions even more.

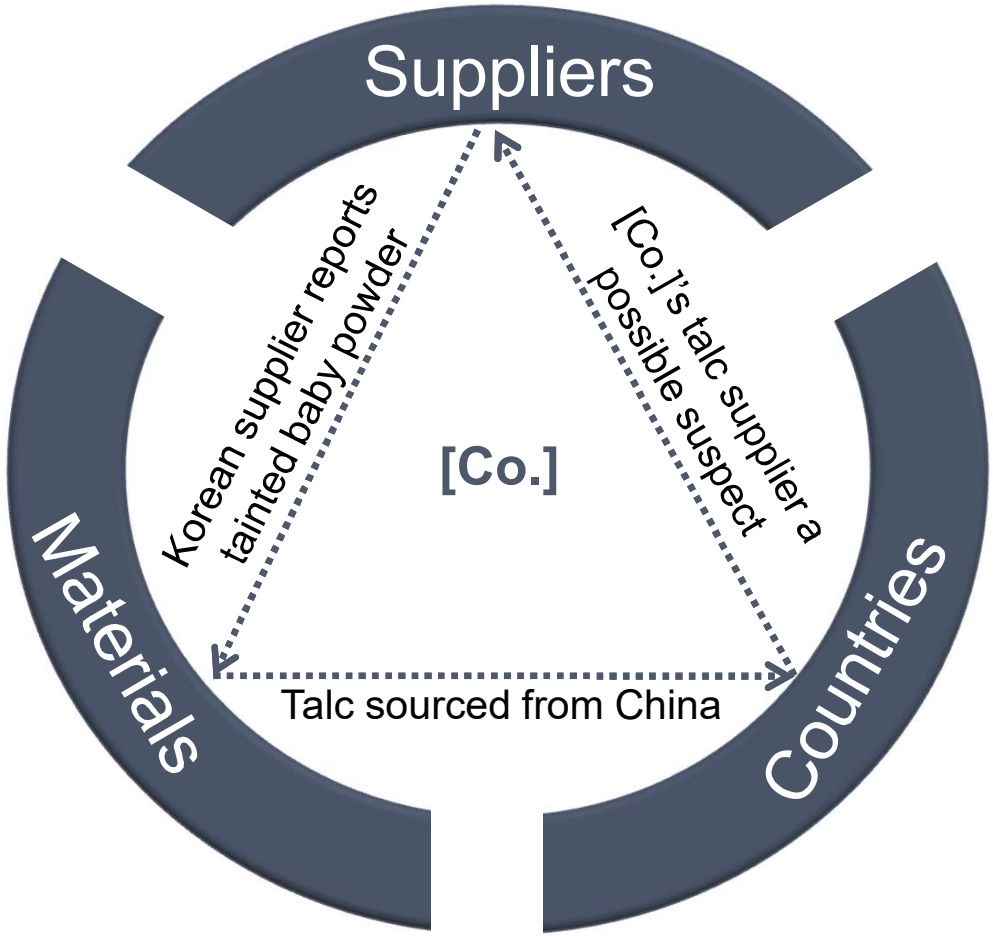
Can we have something like cool boxes (1) Early intel, (2) Key resulting actions.

That we identified this early and that they took important action as a result must jump from the first slide of this section
Mathieu Trepanier, 5/12/2009

MT39

Key Finding: Talcum powder

- **Hindsight is 20/20**
  - We need to draw lateral connections before the media and regulators
  - Closely monitoring Chinese suppliers and pharma press would not have caught this issue MT31



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Slide 13

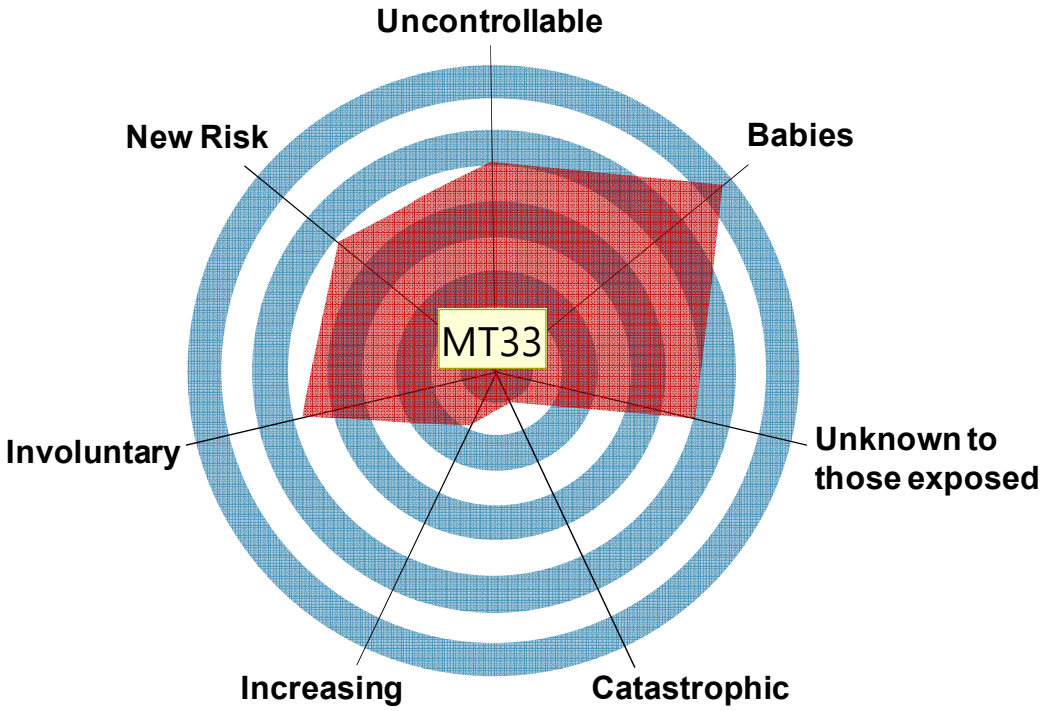
MT31 pharmaceutical industry press is often insufficient to enable a holistic understanding or something like this.
Mathieu Trepanier, 5/12/2009

MT39 The picture is very nice!
Mathieu Trepanier, 5/12/2009

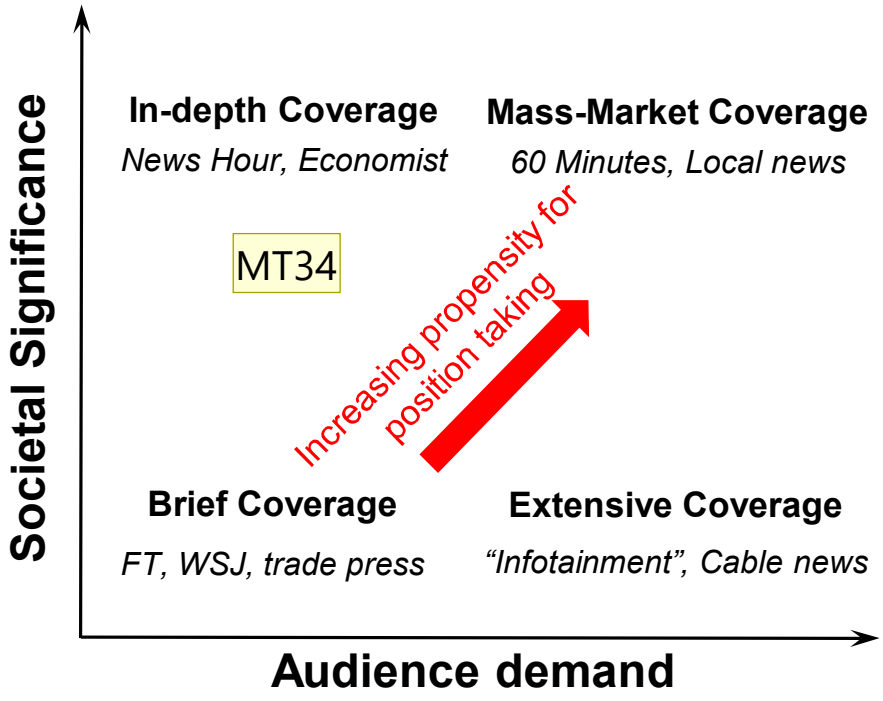
Key Finding: Talcum powder

- **Why did this become an issue?** MT35
  - Public primed to watch for Asian ingredient safety issues MT36
  - Robust risk profile (particularly the involvement of babies) raises media attention

Risk Profile: Talc



Issue escalation in media



Slide 14

MT34 Use a blank one and show the key risk profile dimensions as impacting the propensity for critical media coverage. (see older decks for examples)
Mathieu Trepanier, 5/12/2009

MT33 New Risk should be New risk

Babies should be Vulnerable populations (e.g. babies)
Mathieu Trepanier, 5/12/2009

MT35 Why is talc contamination a high risk issue?
Mathieu Trepanier, 5/12/2009

MT36 This is a good idea, but it should be even clearer.
Mathieu Trepanier, 5/12/2009

Key Finding: Talcum powder

- **4/3/09 – Baby powder in S. Korea is found to be contaminated with asbestos**
  - FirstSight identifies the story in Korean regulatory, C2C news first MT37
  - Story appears in industry news on 4/9/09
  - This story still has not fully developed in major US outlets (e.g. WSJ and NYT)
- **Source of contamination is tainted talc, probably Chinese** MT38
  - [Co.] uses talc in a variety of applications
- **4/13/09 – Korean media questions [Co.] affiliate over safety**
  - [Co.] has to draft PR response on short notice
- **[Co.] takes action after Korean inquest**
  - Sends preliminary impact analysis to QA
  - Ludwigshafen plant found to be purchaser of Chinese talc
- **Ludwigshafen investigates issue, taking many steps**
  - On site testing/verification of Chinese talc lots
  - Ongoing monitoring of talc sourcing down to the extraction level

Slide 15

MT37 Use "user-generated media instead of C2C
Mathieu Trepanier, 5/12/2009

MT38 This slides contains a mix of timelines and general statements. It makes the reading somewhat confusing.

Also, the last two (main) points are the most important (not for the slide, but for the whole section). The goal of the deck is to convince senior management at Abbott that they need this service (i.e. that it supports efficient and timely decision making). These should appear early (and powerfully) at the beginning of the discussion on the issue.
Mathieu Trepanier, 5/12/2009

MT41 Key Finding: Wockhardt distress

- **2/23/09 – Wockardt is experiencing major financial troubles**
  - High debt servicing fees, Forex losses, accounting scandals, poor sales
  - These factors are forcing the company to consider divesting divisions
  - Divestiture could lead to costly supply disruption
- **2/24/09 – [Co.] contacts plants to determine usage**
  - Finds that GPO Pakistan uses 2 Wockhardt products
  - [Co.] analyzes usage, identifies alternatives
- **[Co.] develops contingency plan**
  - Begins approval of new suppliers
  - Expedites remaining orders from Wockhardt

Anticipatory intelligence allowed [Co.] to be prepared for crises while maintaining operations

Slide 16

MT41 See the comments on the first slide for Talc. The idea would be to make it very clear what the intel was and what the actions where. It should jump from the page.

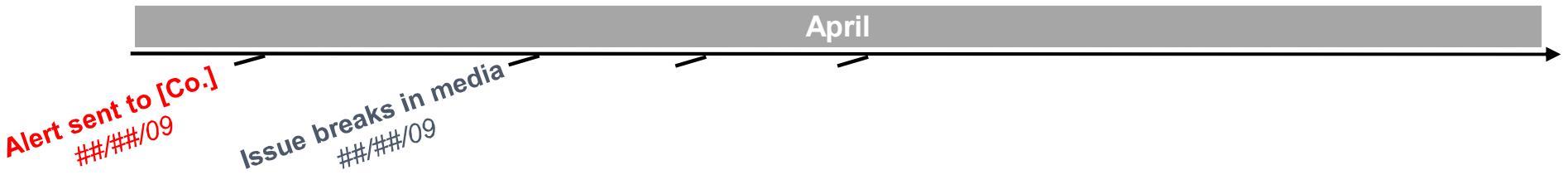
Mathieu Trepanier, 5/12/2009

Key Finding: Wockhardt distress

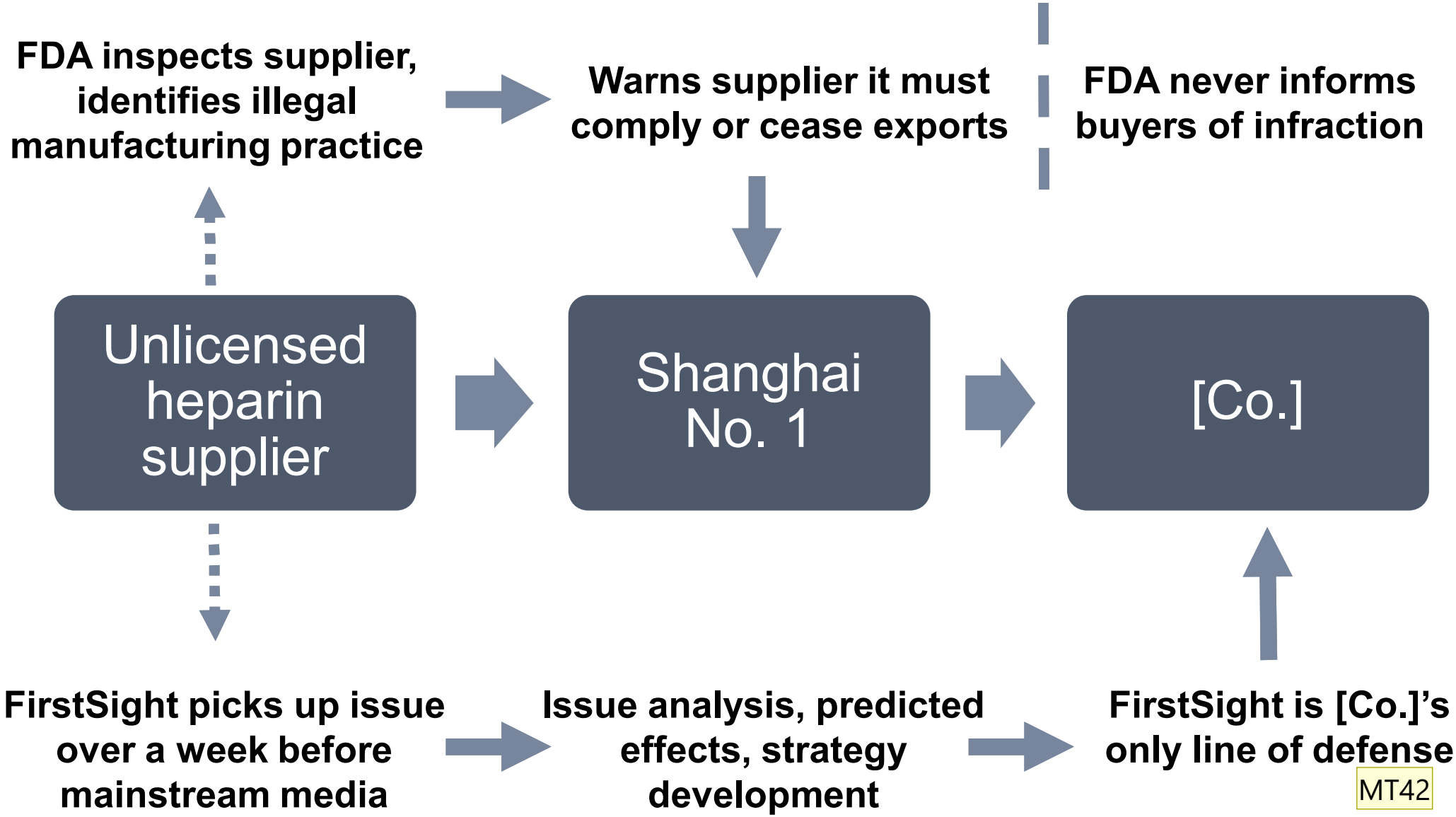
- **Issue**
- **Action**
- **Impact**

Key Finding: Contaminated pigs in China

- **Steroid contamination in pigs threatens heparin supplies**
  - Could lead to similar situation as 2008 heparin crisis
- **[Co.] takes immediate investigative action**
  - QA in China contacts third party supplier of Clivarin in China (Nordmark)
  - Nordmark details heparin manufacturing process, contacts supplier
  - Supplier verifies pigs came from uncontaminated region
- **Impact**



Key Finding: Counterfeit Heparin



Slide 19

MT42 Too strong. Try something like: FirstSight acts as a line of defense for Abbott

Mathieu Trepanier, 5/12/2009

Overview

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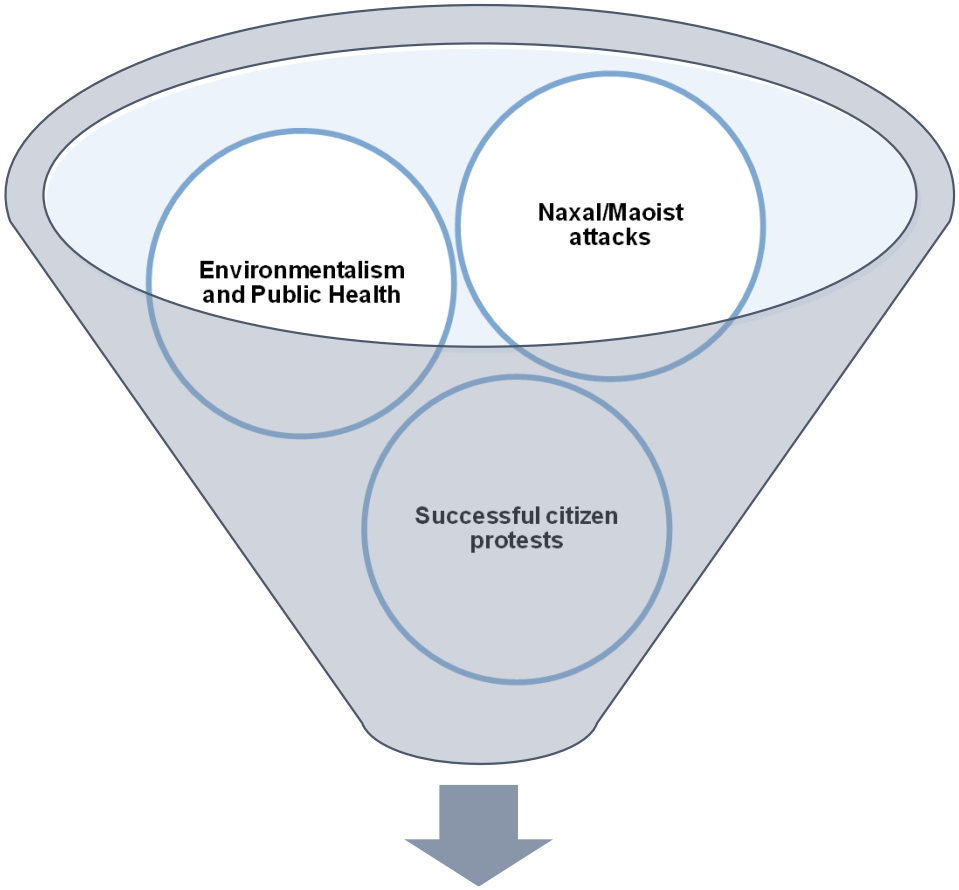
Appendix: Early Warnings

Regulation: China's Environment

- **Issue**
- **Action**
- **Impact**

Indian insurgency MT43



Anti-corporate insurgency

- **Why is this an issue?**
  - Environmental and public health disasters have primed the audience
  - Lower class is becoming more aware that the are left behind
  - Successful citizen protests make citizens feel powerful
  - Idealistic militant groups may galvanize support in rural areas
  - Multiple recent disruptive attacks on corporate targets
- **These events have not been connected in the media**
  - FirstSight's unique methodology allows for the logical mapping of disparate events

Slide 22

MT43 This is good. What we need to make sure is that they see this as actionable in some way. We need to show that they get real value for this. We need to highlight the concrete implications?

Mathieu Trepanier, 5/12/2009

Swine Flu and Heparin Prices MT44

Swine flu outbreak

- Begins in Mexico
- Quickly spreads to US, EU

Government response

- EU governments warn against travel to US, Mexico
- EU countries ban import of pork
- Mexico enacts partial government shutdown
- Egypt mandates the slaughter of all pigs

Supply impact

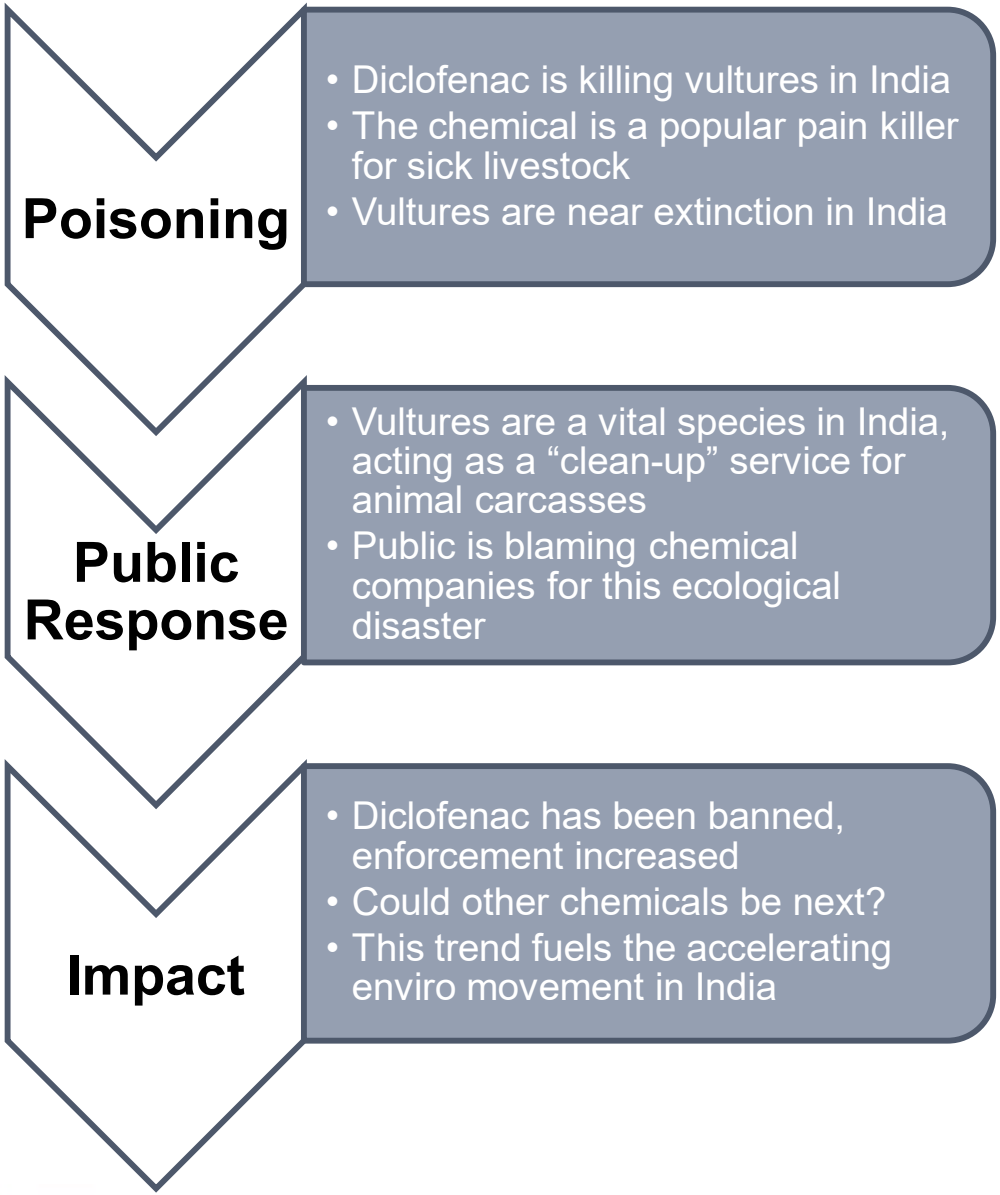
- Slaughter of pigs in heparin supplying countries could lead to supply disruptions and price fluctuations
- May create similar incentive to counterfeit, taint heparin as seen after Chinese “blue ear” disease outbreak in 2008
- Early identification allows for development of contingency strategy

Slide 23

MT44 Same as before. This must be very actionable (can be that we need to continue paying close attention or something like that). Everything in the report must be supporting evidence for why they need our services

Mathieu Trepanier, 5/12/2009

Diclofenac Vulture Activism MT45



- **Sub issue in India**
  - This is part of the larger environmental movement
- **Clearly defined victims and villains**
  - Industry as cast as a villain
  - The environment/citizens are helpless victims
  - Who will be the hero?
- **Early detection allows [Co.] time to develop nonmarket response/influence strategy**
  - Can [Co.] be the hero?
  - Can they avoid being the villain?
  - What are the risks if they don't?

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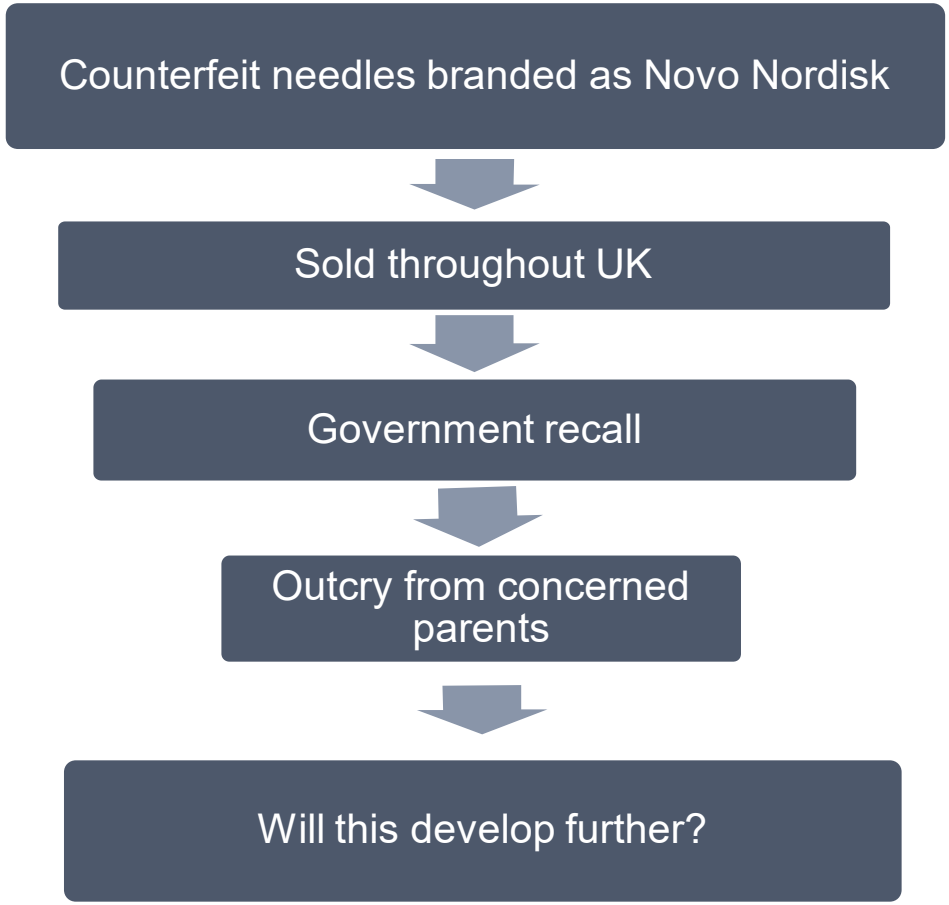
Slide 24

MT45 Same. What are the clear implications for Abbott? What are the risks? What does knowing this today means for them? The answer could be that it allows them to nuderstand the potential issue and toi track indicators (if this is important enough) so that if certain trigger events occur, they can be prepared.

Note that I will not be presenting these slides. They will be sent by email and about a week later, I will discuss with Laura. So they should be self-explanatory (more than usual)

Mathieu Trepanier, 5/12/2009

Insulin Needle Recall



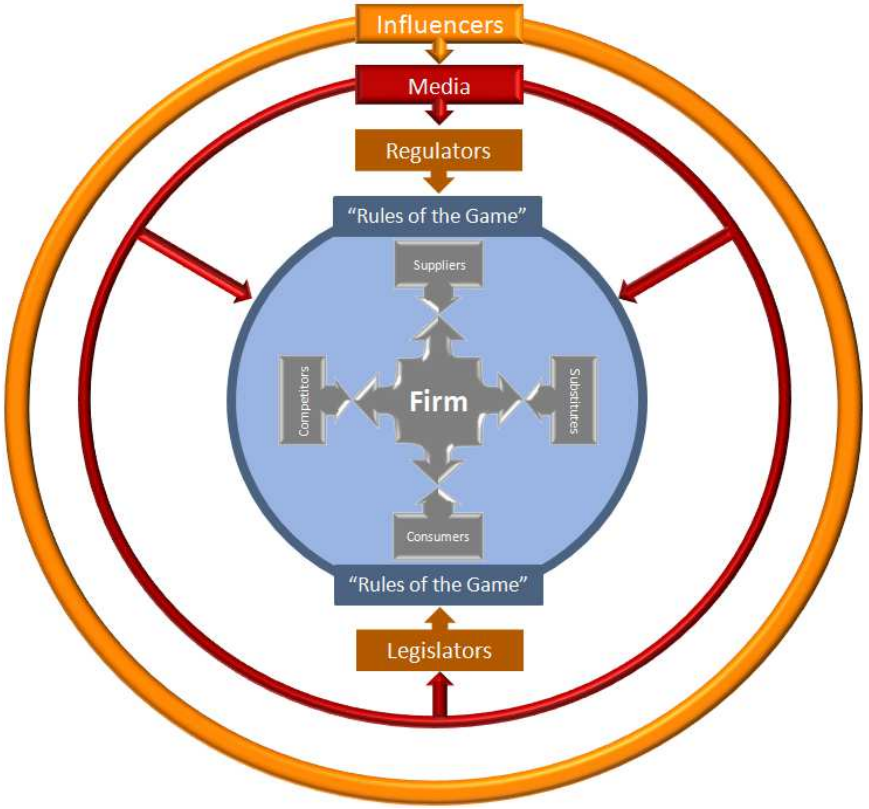
- **Developing issue**
  - This issue has not fully developed in the media
  - Too many unanswered questions…
- **Effect for [Co.]**
  - A case study in counterfeiting
  - Not a typical good to be counterfeited
  - What conditions led to this?
  - How can [Co.] identify these risks in its supply chain?
- **Early understanding of this condition allows for better supply chain analysis** MT46

Slide 25

MT46 This is almost ready. Should be just a little more explicit.
Mathieu Trepanier, 5/12/2009

Extended Intelligence: Regulator Watch

- **Monitor for rhetoric about new regulation and enforcement of existing regulation**
  - Monitor what?
  - Do a graphic for stakeholder environment. Existing influencers graph?
- **Example**



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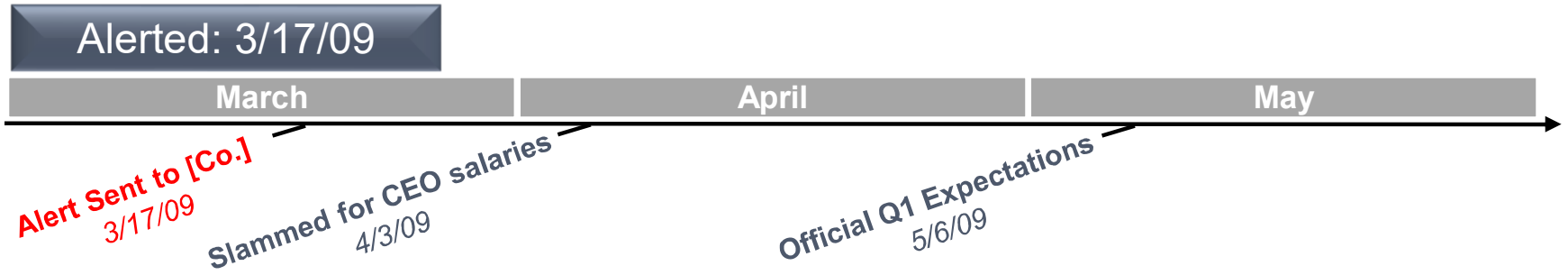
Appendix: Early Warnings

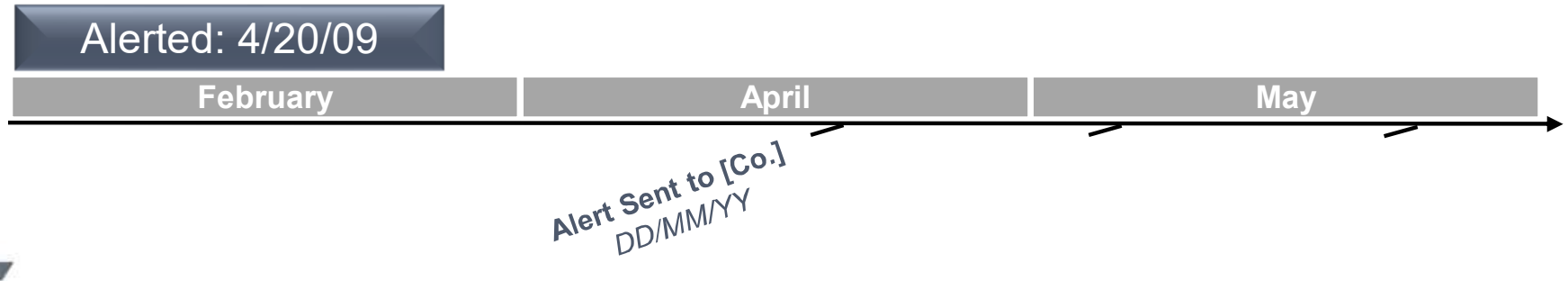
Early Warning: Hubei Guangji Struggling

- **Supplier struggling due to major slump in riboflavin prices**
  - Hubei Guangji produces more than 90% of China's riboflavin
  - Alternate Chinese supplier may be difficult to find
- **Issue emerged as interest piece on Asian manufacturing site**
  - 7 weeks before supplier officially released dismal Q1 projections
- **Supplier later received negative attention in popular media**
  - Scapegoated in local expose on executive pay in failing companies
  - "Worst offender" may face retribution from Chinese government



Early Warning: FDA warns Cipla

- **DMT25ription**
- **Outcome / Implications**
- **Timeline of events (brief research)**
  - Any other companies/industries affected?
  - New regulatory rhetoric
  - Change in popular attention? (maybe Gtrends graph)



Slide 29

MT25 Whenever relevant, add why this would have been hard for Abbott to identify early (without having too much repetition)
Mathieu Trepanier, 5/7/2009