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Cargo Security: *The Calm Before the Storm -- Productivity, Regulation & Technology*

**Transportation Research Forum Annual Meeting
Transportation Security Plenary Session**

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The North River



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The Main Messages

1. Done right, we can have our cake and eat it too on supply chain security and productivity
2. Smart container & trailer technologies will transform best practices
3. Terrorist threats make the regulatory rules of the game unstable
4. Message #3 may distort #1 and #2



Making Sense at the Intersection of

- **Supply Chain Systems**
- **Freight Operations**
- **Tracking & Monitoring Technologies**
- **Business Economics**
- **Security**

Sources & References for **Supply Chain Security, Productivity, & Technology***

- ◆ **Security and productivity**
 - **“Some Good News on Cargo Security”** (2004)
 - **“The Dynamics of Supply Chain Security”** (for the G-8, 2004)
 - **“Security must yield an economic benefit”** (2003)
 - **“Supply Chain Security Without Tears”** (2003, with Hau Lee)
 - **“Freight Transportation Security and Productivity”** (2002)
 - **“Defense Logistics...” trends and implications** (2001)
- ◆ **Technology for security and productivity**
 - **“Mechanical Seal Market Analysis”** (2005, with Ken Troup)
 - **Smart Container Product and Market Reports** (2004, with HSRC)
 - **“APEC Secure Trade Project Preliminary Conceptual Plan,”** (2004)
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 - **“Automating Security: Do E-Seals Make Sense?”** (2003)
 - **“Target Capabilities for the ‘Future Smart Container’”** (2003)
 - **“Technology to Enhance Freight Trans. Security & Productivity”** (2002)
 - **“Electronic Cargo Seals: Context, Technologies, & Marketplace”** (2002)
 - **“Trends in Freight Identification Technology”** (1998)

*Articles and papers by Mike Wolfe

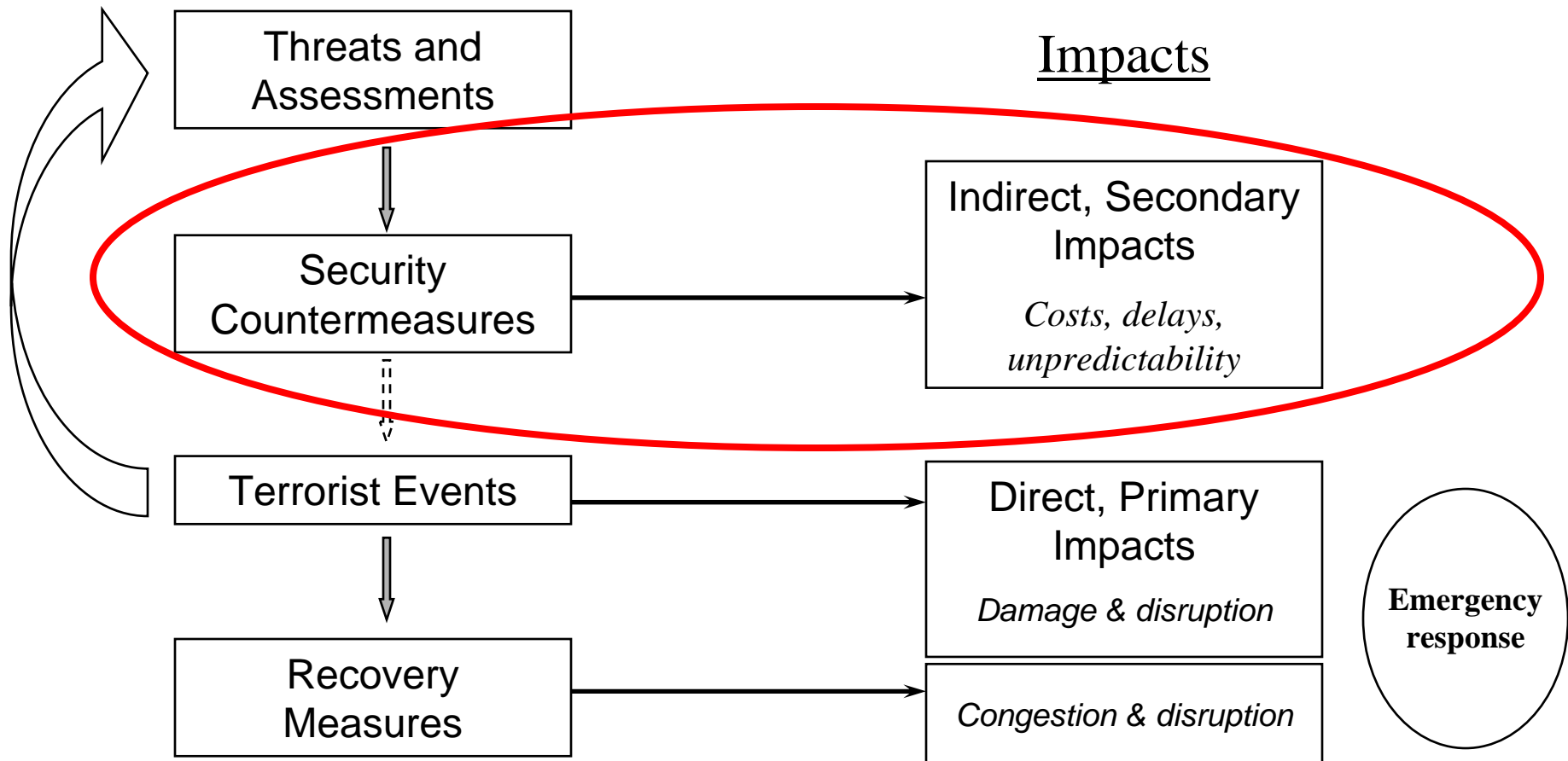
Outline

- ◆ The Rules of the Game are Unstable
- ◆ Supply Chain Security & Productivity
- ◆ Smart Container & Trailer Technologies
- ◆ Market Dynamics & Forecast Scenarios

The Unholy Trinity of Cargo Security Threats

- ◆ Theft Pre-9/11
- ◆ Contraband Pre-9/11
 - Drugs
 - Customs evasion
 - Counterfeit and gray market goods
 - Stowaways
- ◆ Terrorism Post-9/11
 - High potential for trade disruption

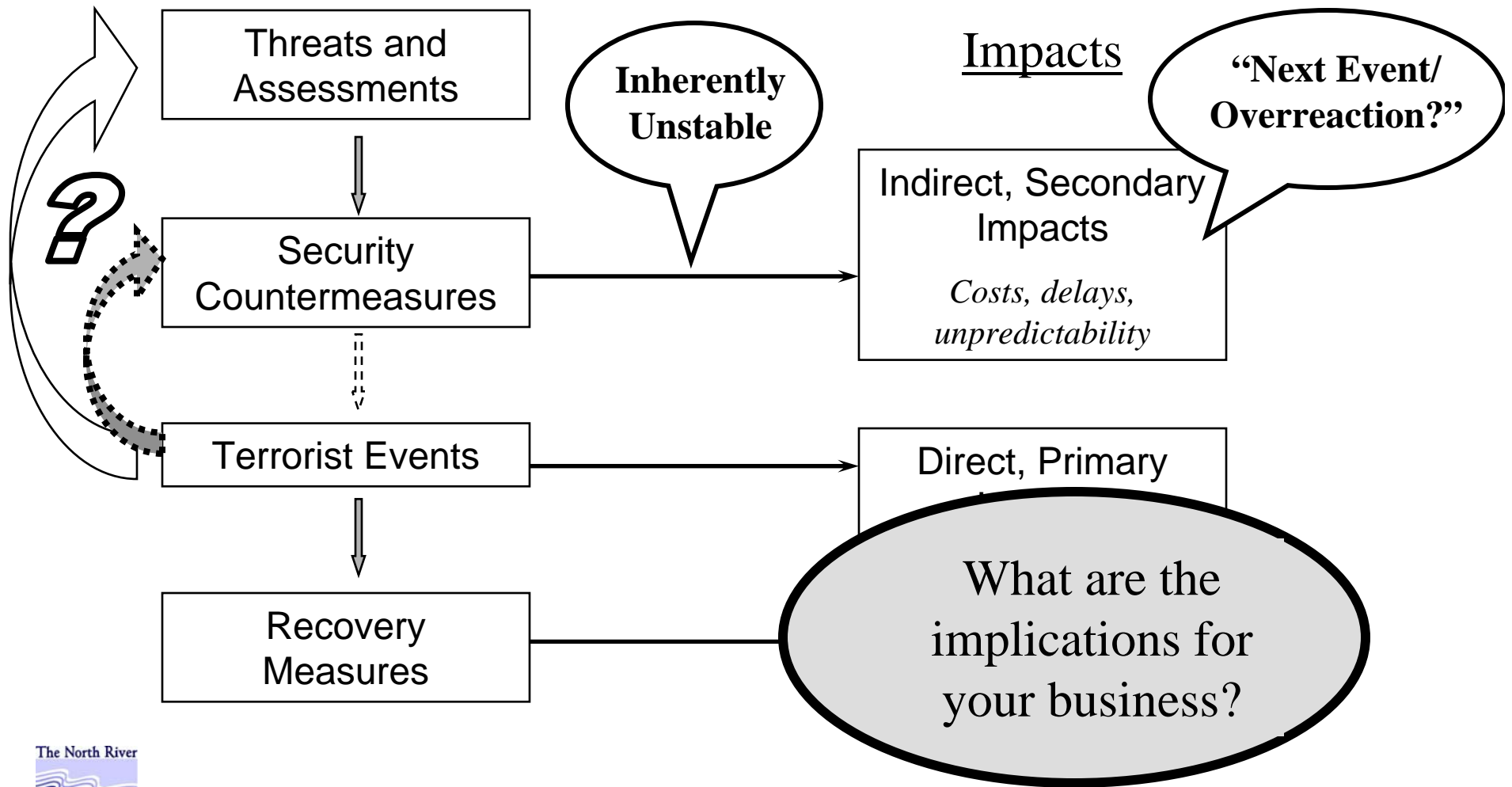
Threats, Countermeasures, and Impacts



Potential for Self-Inflicted Wounds

“How rational will ‘we’ remain after a second or third major terrorist attack?”

Regulatory Dynamics



Outline

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Security Needs From Logistics

- ◆ Assured integrity of conveyance loading and documentation
- ◆ Significantly reduced risk of undetected tampering in transit
- ◆ Accurate, complete, and timely information about shipments

*Smart container technologies
contribute most in these areas*

Logistics Needs From Security

- ◆ Reliable, predictable processing times
- ◆ Protection of commercial information
- ◆ Globally harmonized security processes
- ◆ Security as a byproduct of supply chain management

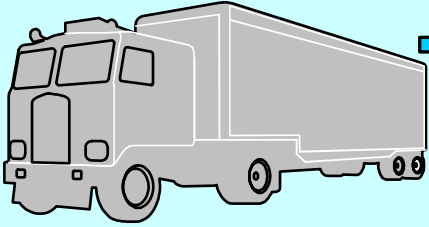
Technology can have great impact here

The Leverage Point...

- ◆ ...is technologies and processes to enhance cargo visibility and control
 - Goods in transit
 - Conveyances and equipment
 - Assured chain of custody

Smart container, smart trailer, and smart shipment technologies

Auto ID Technologies



Conveyance

- Bar code & 2D labels
- RF tags
- Satellite transponders

*Every shipment is a
chain of nested
transactions that
should be transparent*

Business Attractions of Smart Containers

- ◆ Better container tracking information
 - Enable capacity optimization – manage congestion effects
 - Reduce time, cost, and service quality impact of misrouted containers
- ◆ Reduce labor impacts
 - Cost and workload
- ◆ Increase chain-of-custody seal validation
 - Automation rather than human (non)inspection

Making Money from Better Visibility and Control

Benefit model categories:

- ◆ Better operating efficiency
 - Fleet, equipment, and labor utilization
 - Less wasted effort
 - Mitigate congestion impacts
- ◆ Better operational effectiveness
 - More reliable service
 - More flexible operations
 - Customer inventory savings
- ◆ Shipment integrity
 - Less theft of goods and services

Quantitative Benefit Estimates

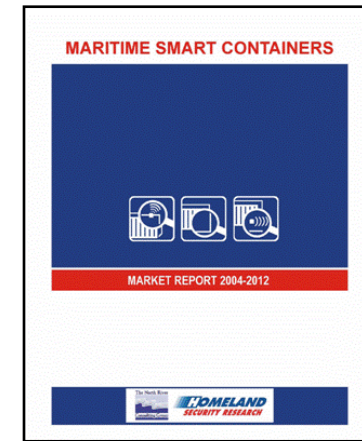
Technology/Process	Dollar Range	Unit of Measure
Asset tracking, mobile communications (<i>ref. 6.B</i>)	\$7,866 and \$15,222	Annual savings per tractor
Asset tracking, chassis tracking (<i>ref. 5</i>)	\$210.35	Annual savings per chassis
Asset tracking, containers with RFID (<i>refs. 7.A, 7.B</i>)	\$400	Benefits to shippers per container load
Freight status information, ESCM and biometric ID (<i>ref. 1</i>)	\$13.00	Time and labor savings per air freight shipment
Gateway facilitation among ports, highways, and border crossings (<i>ref. 2</i>)	\$12.8 to \$24.8 million	Annual regional savings
Network status information, FIRST-like capabilities (<i>ref. 3</i>)	\$21.36 and \$247.57	Savings per terminal trip
<i>Source: Draft report prepared by North River for FHWA</i>		

Outline

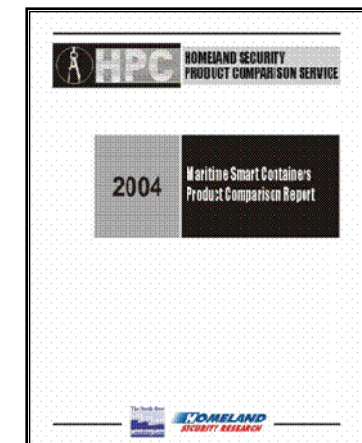
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- ◆ **Smart Container & Trailer Technologies**
- ◆ Market Dynamics & Forecast Scenarios

The Smart Container Books

◆ Smart Container
Technology and Market
Forecast, 2004-2012



◆ Smart Container
Product Comparison
Report, 2004



Main Elements of the Smart Container Technology & Market Study to 2012

- ◆ Analysis of regulations and standards
- ◆ Market drivers, inhibitors and dynamics
- ◆ Current technologies
- ◆ Product & technology outlook
- ◆ Market & pricing outlook
- ◆ Economic assessment – costs, benefits, & cost/benefit
- ◆ Vendor outlook and profiles
- ◆ Smart container patent review

What is a Smart Container?

- ◆ Three main ingredients
 - Processing power
 - » Sensors, memory, & decisions
 - Communications
 - Electrical power
- ◆ Two sets of benefits
 - Supply chain management
 - Supply chain security

*No box is really smart except as part
of a smarter network*

Smart Container Technologies

- ◆ Container tracking
 - Long-distance mobile
 - Short-distance point - RFID
- ◆ Processing power and sensors
 - E-seals & intrusion detection systems
 - Cargo condition and threat detection sensors

Potential Sensor Suites

- ◆ Productivity
 - Container full/partial/empty
 - Temperature/cargo condition
 - Location
- ◆ Security
 - Doors open/doors closed
 - Intrusion detection
 - Explosives
 - Nuclear/radiological
 - Chemicals
 - Human presence
 - Biological agents (if feasible)
- ◆ Device operation
 - Battery & self condition

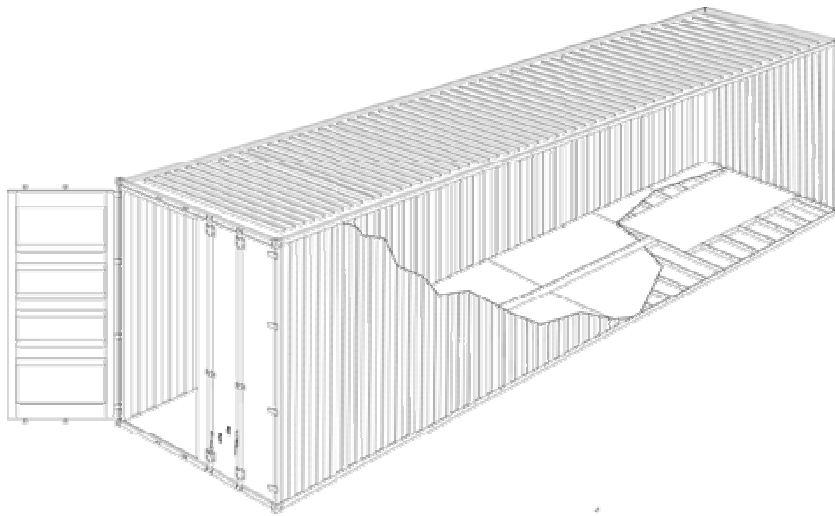
Advanced Security Devices

- ◆ “Future Smart Container”
 - Wolfe, Container Working Group, early '03
- ◆ Advanced Container Security Device
 - HSARPA 3 phase competition, 6 winners so far
 - » “6 wall” intrusion detection
 - » Human presence
 - » Sensors

Essence of the Technology and Price Analyses

- ◆ Present generation equipment
 - Evolution into effective supply chain management tools
 - Moderate security value
 - *"Supply chain smart computer"*
- ◆ Next generation equipment, >2008
 - Higher security value
 - Develop out of ACSD program
 - *"High security smart container"*
- ◆ Commercial value will reside in the *supply chain SC*
- ◆ Added capability of *high security SC* won't pay off commercially
 - It is more a national security than business benefit
 - Except for niches, adoption will require incentives or mandates

Despite Our Forecast, Some New Players Assert They Solved the Puzzle. For example...



Security Measures for the Future



- ◆ Detects
 - 6 wall intrusion detection
 - Radiation
 - Targeted chemicals
 - People
 - Cargo shifting
- ◆ Radio Structural Scanning (RSS)
 - Microwave technology

Outline

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Technology Market Dynamics

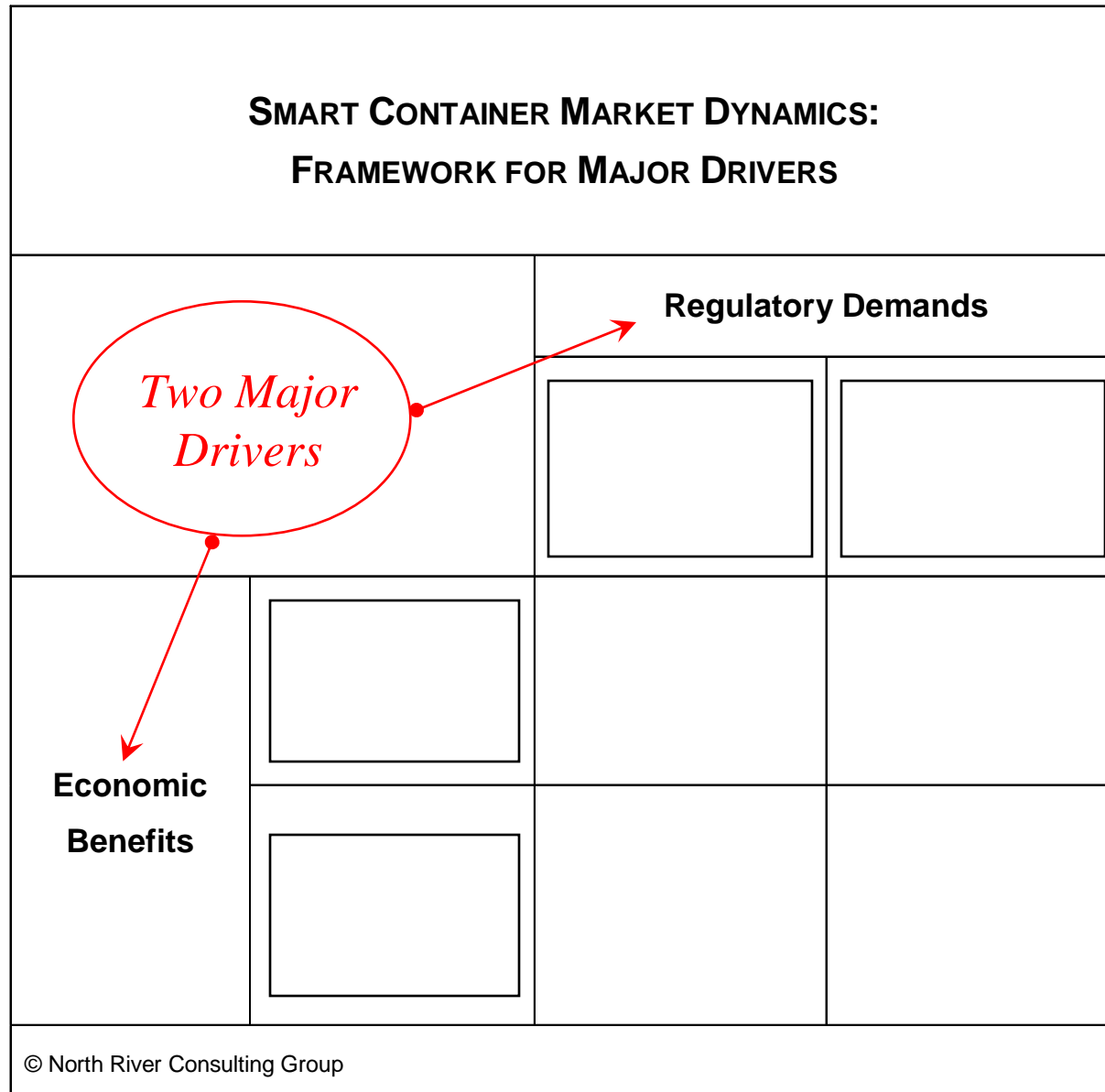
- ◆ Supply chain security is *not* a typical new technology market
 - Regulations drive as well as economics
 - Politics and emotion can dominate security regulatory processes

*Following slides emphasize containers.
Same analysis applies to trailers.*

Smart Conveyance Market Dynamics

- ◆ Market drivers include
 - Powerful long-term price/performance trends
 - Customer demands
- ◆ Market inhibitors include
 - Skepticism about costs and efficacy
 - Resistance to regulation
- ◆ Biggest factors: economics & regulations

Forecasting Smart Conveyance Growth



SMART CONTAINER MARKET DYNAMICS

		Regulatory Demands	
		Low Regulatory Pressure for Smart Containers	High Regulatory Pressure for Smart Containers
Economic Benefits	Strong Evidence of Smart Container Economic Value	III - Sweet Typical New Technology “Lazy S” or “Hockey Stick” Adoption Curve	IV - Steroidal Accelerated Enhancement and Adoption
	Little Evidence of Smart Container Economic Value	I - Slow Slow, Specialized and Limited Adoption	II - Sour Reluctant Adoption Over High Resistance and Delaying Tactics
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Main Driver of Regulatory Demand for Smart Conveyance

SMART CONTAINER MARKET DYNAMICS			
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- ◆ North River Assessment:
 - High regulatory pressure for smart container or trailer adoption can come only after a meaningful supply chain-oriented terror event
- ◆ Scenario I, 2004-2012:
 - No relevant terror event
- ◆ Scenario II, 2004-2012:
 - Relevant terror event in 2005

Highlights of Scenario I, 2004-2012: No Meaningful Relevant Terror Attack

Low Regulatory Pressure

SMART CONTAINER MARKET DYNAMICS			
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- ◆ Classic new technology introduction, with a boost from war on terror (R&D, pilots, etc.) (Cell I)
- ◆ Competitive pressures will shift market decisively as successful early adopters reap benefits (Cell III)
- ◆ Smart conveyances will become accepted best practice for supply chain operations during forecast period
- ◆ Security benefits
 - Significant reduction in cargo theft and smuggling
 - Enhanced protection against terrorist exploitation

Highlights of Scenario II, 2004-2012: Serious Container Terror Attack in 2005

High Regulatory Pressure

SMART CONTAINER MARKET DYNAMICS			
		Regulatory Demands	
		Low Regulatory Pressure for Smart Containers	High Regulatory Pressure for Smart Containers
Economic Benefits	Strong Evidence of Smart Container Economic Value	III - Sweet Typical New Technology "Lazy S" or "Hockey Stick" Adoption Curve	IV - Steroidal Accelerated Enhancement and Adoption
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- ◆ At time of attack, smart container benefits still unproven (Cell I)
- ◆ Political overreaction to attack produces premature mandates for smart container technologies (Cell II)
- ◆ Forced use accelerates learning curves for benefits (move towards Cell IV)
- ◆ Market for and use of smart containers builds faster and higher than Scenario I
- ◆ Security benefits
 - Significant reduction in cargo theft and smuggling
 - Enhanced protection against terrorist exploitation

Product and Marketing Implications

- ◆ Due diligence should assess multiple market environments
- ◆ Not all smart conveyance solutions are equal
 - Supply chain management + some security benefits
 - High security next generation solutions
- ◆ Focus on the business case for users
 - Favorable economics is the most dependable driver

Keep Technology in Perspective

- ◆ Technology is not magic
 - “Just because it’s electronic doesn’t mean it’s better”
 - Good processes and discipline are critical
 - Institutional challenges are toughest
- ◆ Technology is not irrelevant
 - “Just because it’s electronic doesn’t mean it’s a mistake”
 - Smart technology can
 - » Enhance good processes
 - » Simplify demands on the workforce

Big Picture Conclusion on “Supply Chain Smart Containers”

- ◆ With or without security pressures ...
- ◆ With or without ACSD research ...
- ◆ Smart containers will be deployed for commercial reasons, to make money for users
 - The question is *when and how*, not *whether*
 - Moore’s Law will bring them to the market

*In 1985, satellite monitoring of trucks
seemed like a pipe dream.*

*In 1990, Schneider National deployed
Qualcomm’s OmniTRACS*

Thank you for your attention

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 - » Journal of Commerce, July 26, 2004
- **"The Dynamics of Supply Chain Security" (2004)**
 - » G-8 Summit edition of The Monitor, Univ. of GA, Center for International Trade and Security
- **"Security Must Yield an Economic Benefit" (2003)**
 - » Journal of Commerce, December 1, 2003
- **"Supply Chain Security Without Tears" (2003)****
 - » www.manufacturing.net/scm/index.asp?layout=articleWebzine&articleid=CA278114
- **"Freight Transportation Security and Productivity" (2002)**
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◆ Technology for security and productivity

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- **"APEC Secure Trade Project Preliminary Conceptual Plan," (2004)**
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- **"Technology Views and Issues" (2004)**
 - » Cairo Transportation Security Forum Resource Guide, www.tda.gov
- **"Automating Security: Do E-Seals Make Sense?" (2003)**
 - » www.eyefortransport.com/index.asp?news=33911&nli=freight&ch=
- **"Target Capabilities for the 'Future Smart Container'" (2003)**
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- **"Trends in Freight Identification Technology" (1998)**
 - » Email from Mike Wolfe (noriver@att.net, 781-834-4169)

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**Co-authored with Hau Lee, Stanford