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Future Analytics of Cyber Risk Quantification

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Dr Christos Mitas VP of Model Development Risk Management Solutions

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Future of Cyber, Cambridge Judge Business School

July 24, 2019

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CYBER RISK

- Why is it there?
 - Accelerated digitization (software eats the world)
- What is it?
 - Which components does it comprise of? (physics)
 - How do they change? (*dynamics*)
 - Is it systemic?
 - How can it be quantified?
- What to do about it?
 - At present
 - In the future



WHY?

SECTOR	Overall	Digital Spending Digital Asset Stock	Transactions	Interactions	Business Processes	Market Making	Digital Spending on Workers	Digital Capital Deepening	Digitalization of Work
Information & Communications Technology									
Media									
Professional Services									
Finance & Insurance									
Wholesale Trade									
Advanced Manufacturing									
Oil & Gas									
Utilities					-				
Chemicals & Pharmaceuticals									
Basic Goods Manufacturing									
Mining	_								_
Real Estate									
Transportation & Warehousing	_								
Education									
Retail Trade	_								
Entertainment & Recreation	_								
Personal & Local Services									
Government	_								
Healthcare	_								
Hospitality									
Construction									
Agriculture & Hunting		1							
	OVERALL	ASSETS		US	AGE			LABOR	

Relative degree of digitization. Harvard Business Review.





WHAT - PHYSICS





THREAT ACTOR DYNAMICS

- Taxonomy of APTs
 - Organized Crime (Hub & Hierarchical)
 - Nation-State
 - State-Sponsored
 - Mercenary
 - Hacktivist
- Motivation
 - Political/Geopolitical
 - Financial
- Skills, Capabilities, Size









DYNAMICS OF SECURITY DEFENCES

- IT Security
 - Budget
 - Team
 - CISO
 - Skills, Capabilities, Size
 - Best practices
- Endpoint security
 - Signature-based
 - ML/AI (i.e. pattern-recognition)
- Patching cadence
- Cryptographic Encryption



Webservers

- Data servers
- Devices
- Digital Assets
- Processes
- Data
- IP



CHANGES IN REGULATORY ENVIRONMENT

- EU's GDPR
 - In effect from May 2018
 - Notable fines
 - BA: £183M
 - Marriot: £99M
- US, Canada, India, Australia
 - Strong regulations
- China
 - Following close
- Japan
 - Aligns with GDPR



DLA and CCRS, Cyber Outlook Report, 2019



IS CYBER RISK SYSTEMIC?



Systemic Cyber Risk

- How it is defined and how it arises:
 - Inter-connectedness
- Quantification of cyber risk is required to determine
 - How cyber risk flows through businesses?
 - How cyber risk accumulates across the industry? _____
 - How various cyber risks are correlated? _
 - How can the business community plan for and defend against it? ____
 - How can the re/insurance industry help create stability?





Systemic Cyber RISK

What have we observed?

ALL KNOWN HISTORICAL EVENTS

SYSTEMIC EVENTS



Systemic Cyber Risk

What have we observed?



ALL KNOWN HISTORICAL EVENTS

SYSTEMIC

EVENTS



Systemic cyber risk

- What have we observed?
- Short historical record
- "Τα πάντα ρει"
- Threat landscape, attack vectors, vulnerabilities and digital assets are constantly changing
- History can only get us so far → need for cyber risk models



RMS

HOW CAN CYBER RISK BE QUANTIFIED?



BUILDING BLOCKS





MODELLING TECHNIQUES





don't forget **CYBER-PHYSICAL**

Industrial Facilities





Upstream Energy – Oil Rigs



Building fires







WHAT TO DO?



CYBER RESILIENT ORGANIZATION

	Identify	 Manage people, assets and capabilities 				
	Protect	 Secure critical data Safeguard critical servious 				
	Detect	 Identify security occurre 				
	Respond	 Take action against sec incidents 				
	Recover	Plan for resilienceRestore capabilities				

National Institute of Standards & Technology (NIST)





THE CYBER INSURANCE MARKET – GROWTH



VisionGain Cyber Insurance Market Report 2019-2029



THE CYBER INSURANCE MARKET – KEY STATS





TWO FUTURES

Cyber Armageddon

- Hacker hoards rise
- More powerful attacks
- No data is safe
- Splintered Internet
- E-commerce dies
- Cyber war

Cyber Utopia

- Exorcise the ghosts in the code
- Effective law enforcement
- "Geneva convention" for cyber operations



E.G. CRYPTOGRAPHY

- Paramount for a functioning Internet
 - Privacy
 - E-commerce
- "Prime number factorization"
 - Difficult (really, really difficult)
 - But hasn't been proven impossible
- Shor's algorithm (1994)
 - Very efficient doing so... but it needs quantum computers
 - Which are now real... albeit still not at capacity
 - Could reach required capacity by 2030 2040
- Quantum cryptography
 - Counters suspicious interceptions detectable anomalies
 - But cannot work on the current Internet
- Quantum-resistant algorithms
 - In development; expected around 2025 (NIST)
 - Implementation might need another decade
- Equilibrium will be established
 - Will it be closer to Armageddon or Utopia?
 - And how long will it take?

Fixing things will be tricky



Print edition | Science and technology > Oct 20th 2018



encryption that protects the internet







A PRUDENT RISK MANAGEMENT APPROACH



Regardless of Cybergeddon, Cybertopia, or something in between (most likely state)



RESOURCES





