



# Policy and Regulatory Implications of Big Data and Cloud Computing

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ITU Workshop on Big Data and Cloud Computing,  
Tashkent, Uzbekistan, 20 June 2018

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## Policy & Regulatory Implications of Big Data & the Cloud

1. Big Data
2. Artificial Intelligence (AI)
3. Cloud Computing
4. Regulatory framework for the Internet of Things (IoT);



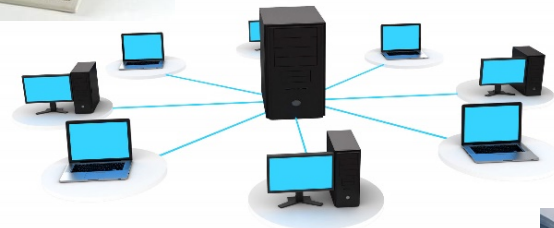


## Evolution in Computing

1980s: the Personal Computer



1990s: the Local Area Network



2000s: Data Centers and the Cloud

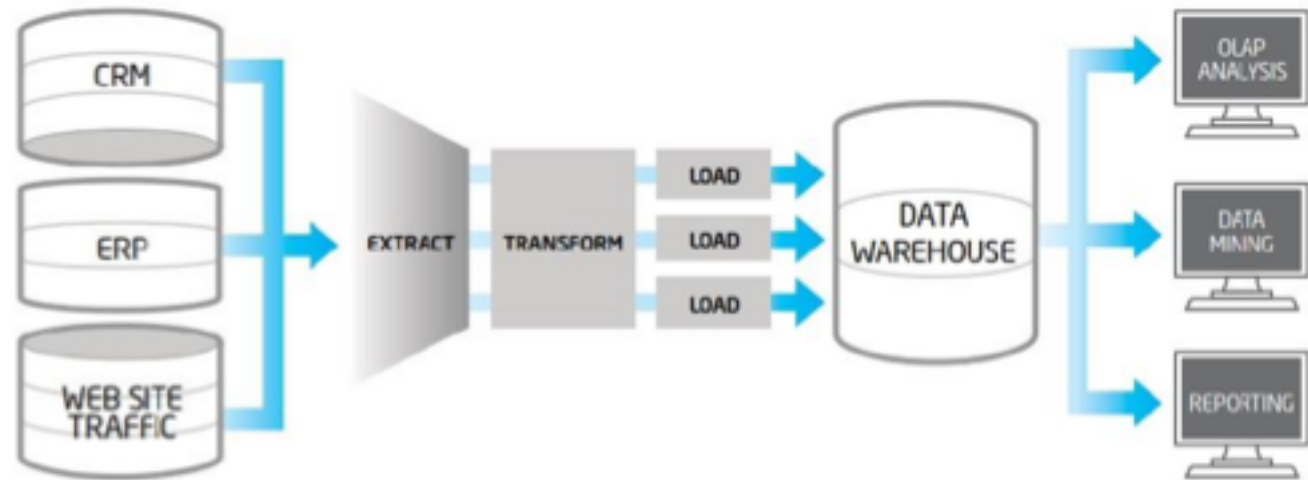


2010s: (Mobile) Edge Computing





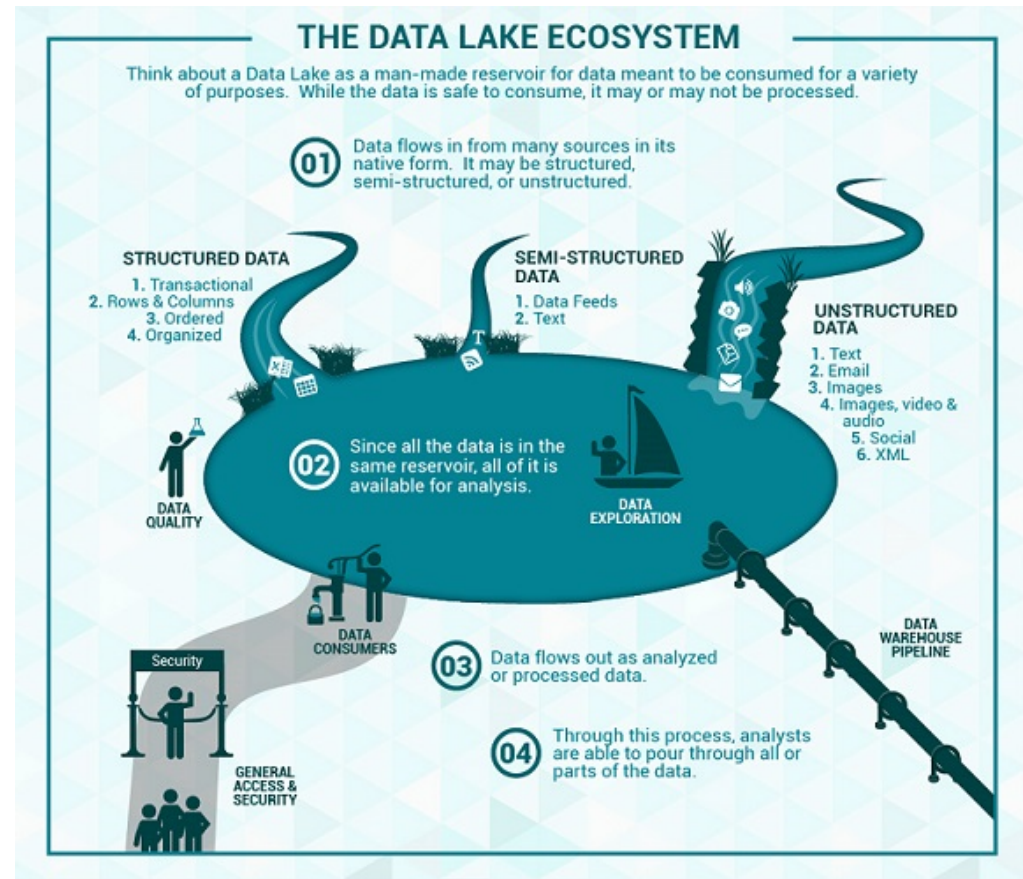
# From hard drives to data warehouses for structured data ...





## ... to data lakes for potentially unstructured data:

1. Organized, partially organised, and unorganised data flow in;
2. Analyzed and processed data flow out – to data warehouses, to data consumers, and for screening by security.





## Laws of Accelerating, Exponential Returns on IT

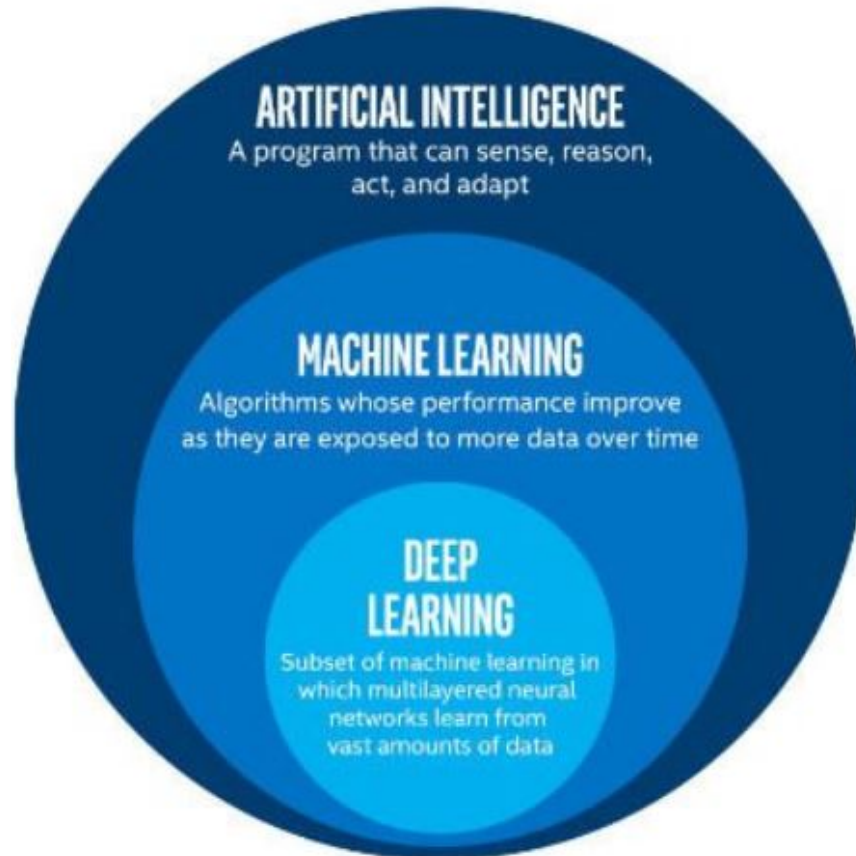


- Moore's Law: speed cost halves every 18 months
- Kryder's Law: memory cost halves every year
- Nielsen's Law: bandwidth cost halves every two years





# From AI to Machine Learning to Deep Learning



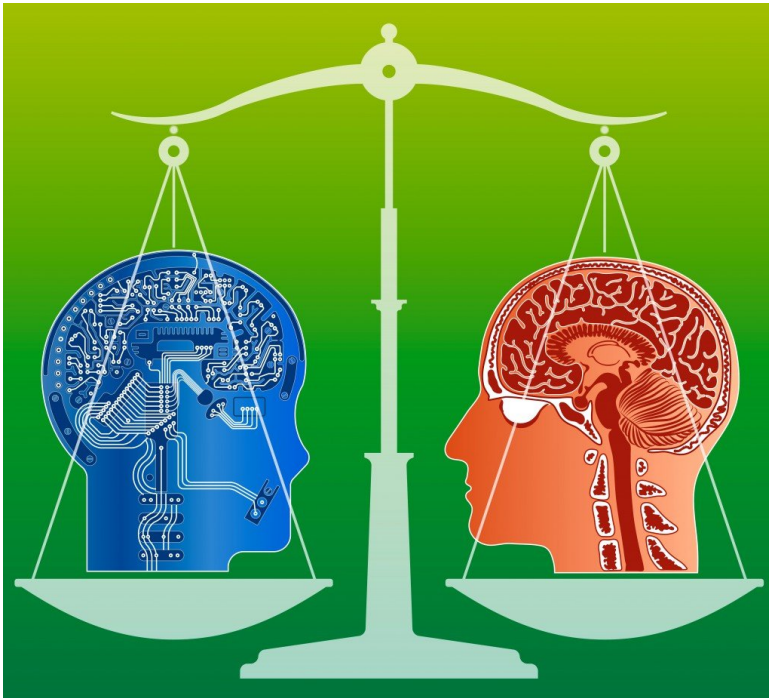
AI: works like human mind, via pattern recognition

Machine Learning: labor-intensive pre-ID'ing of objects with supervised training;

Deep Learning: self-learning, sophisticated algorithms of multi-layered (i.e. "deep") matrix-algebra computations



## AI – What can it do?



The Singularity is still decades away.

Focus on narrow, rather than general, AI:  
domain-specific, machine-learning  
solutions based on specific algorithms for  
narrow tasks such as customer-service  
chat bots







## AI – machine, man, or both? Results from the chess masters:



Centaur or cyborgs, i.e. man and machine in combination, outperform machine alone.





## AI – What can it do?



A virtuous circle of more data yielding better algorithms that make for better products and services, which attract more users, who provide still more data ...





# Sample Uses of Robotics and AI in Agriculture

## ANALYZING SATELLITE IMAGES



## IN-FIELD MONITORING



## ASSESSING CROP/SOIL HEALTH



## PREDICTIVE ANALYTICS



## AGRICULTURAL ROBOTS





# Do governments need to protect jobs from AI?

1920                      1940                      1960                      1980                      2000                      2020

**MARCH OF THE MACHINE MAKES IDLE HANDS**

As the march of the machine goes forward, the workers' hands are being left behind. The machine is taking the place of the man, and the man is being left behind. The machine is taking the place of the man, and the man is being left behind.

**DOES MACHINE DISPLACE MEN IN THE LONG RUN?**

New Studies Claim an Old Argument is Renewed Over Significance of 'Technological Unemployment'

**'IS THE ROBOT DECIDING TO JOIN?'**

**Will Robots Take Our Children's Jobs?**

By MICHELE LANGE DE BONO

**200,000 a Year Will Lose Jobs To Automation, U.S. Aides Say**

By MILLEN BLACKER

WASHINGTON, N.Y., March 4. — A study of the trend in production and employment in the United States over the past 20 years has shown that the rate of technological unemployment is increasing. The study, conducted by the Bureau of Economic Analysis, shows that the number of jobs lost to automation is increasing at a rate of 200,000 a year.

**A Robot Is After Your Job**

By HOWARD

Source: New York Times, 2/26/1928, article by Evans Clark. Originally from Louis Anslow, "Robots have been about to take all the jobs for more than 200



## Push for explainable, responsible, ethical AI





## Issues of liability for AI





## Principles of a Regulatory Framework

### Based on Functionality

Pursue regulatory goals of functional objectives, not legacy structures of industries or technologies

### Dynamic

Prefer performance-based approach via *ex-post* enforcement over prescriptive, *ex-ante* rules

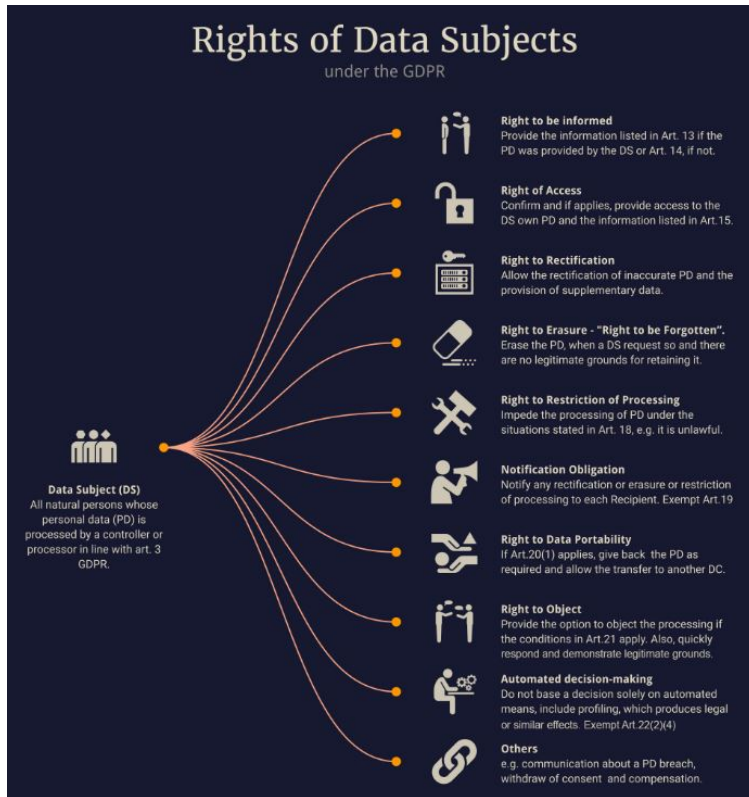
### Bottom-up Assessment

Consider new approaches to address current realities and whether old rules still apply.





# The EU's GDPR versus a possible US approach



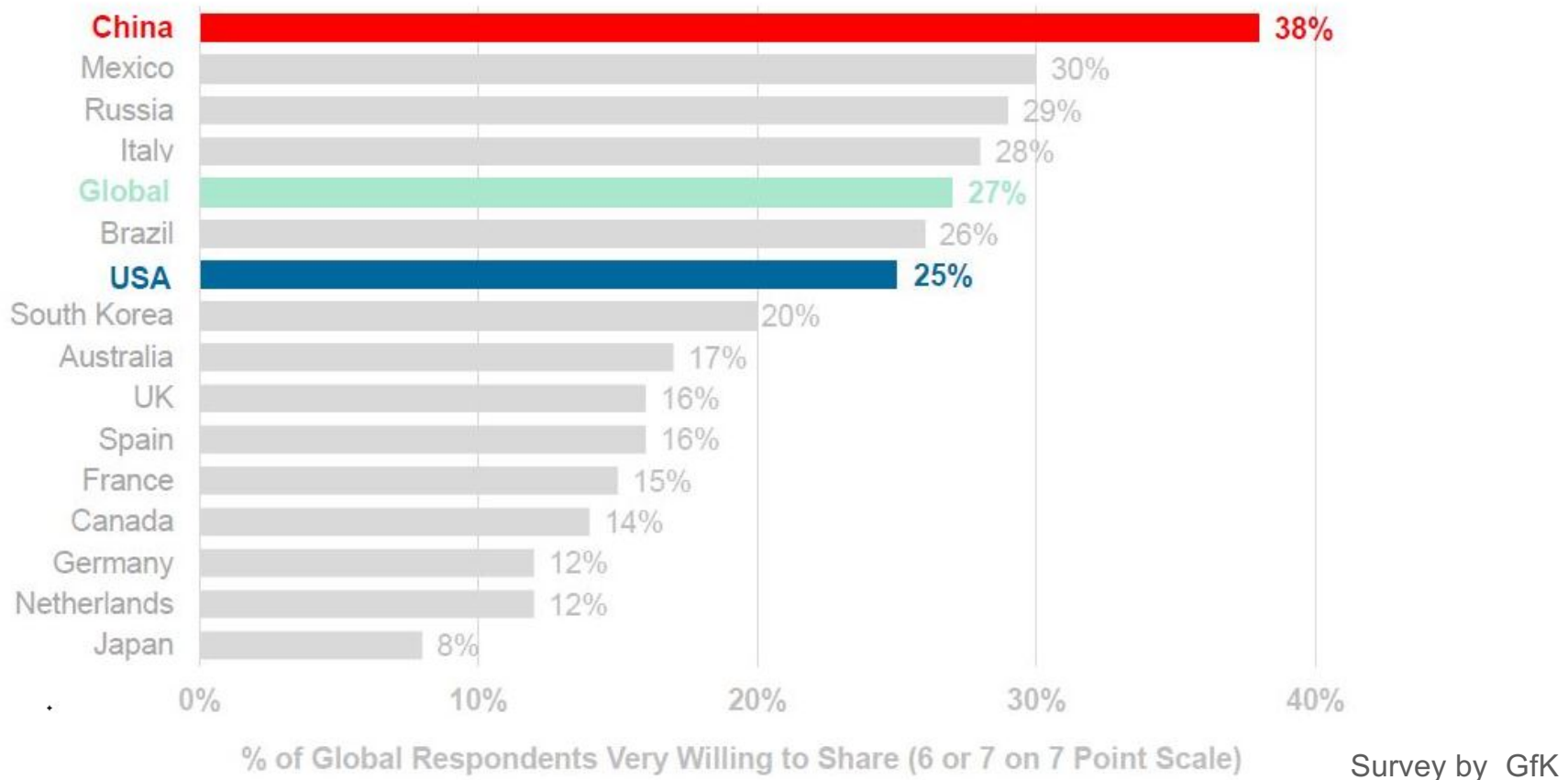
## The US Privacy Shield as a workaround for "adequacy"





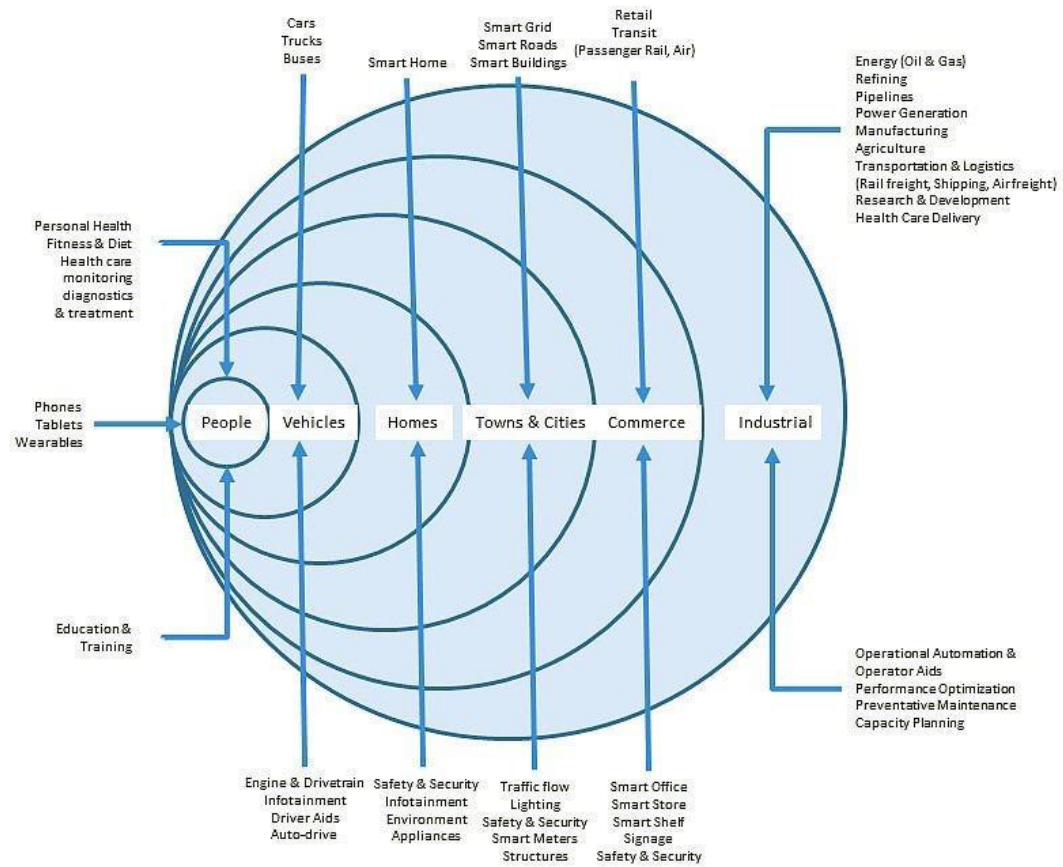


## Willingness to share personal data in return for benefits





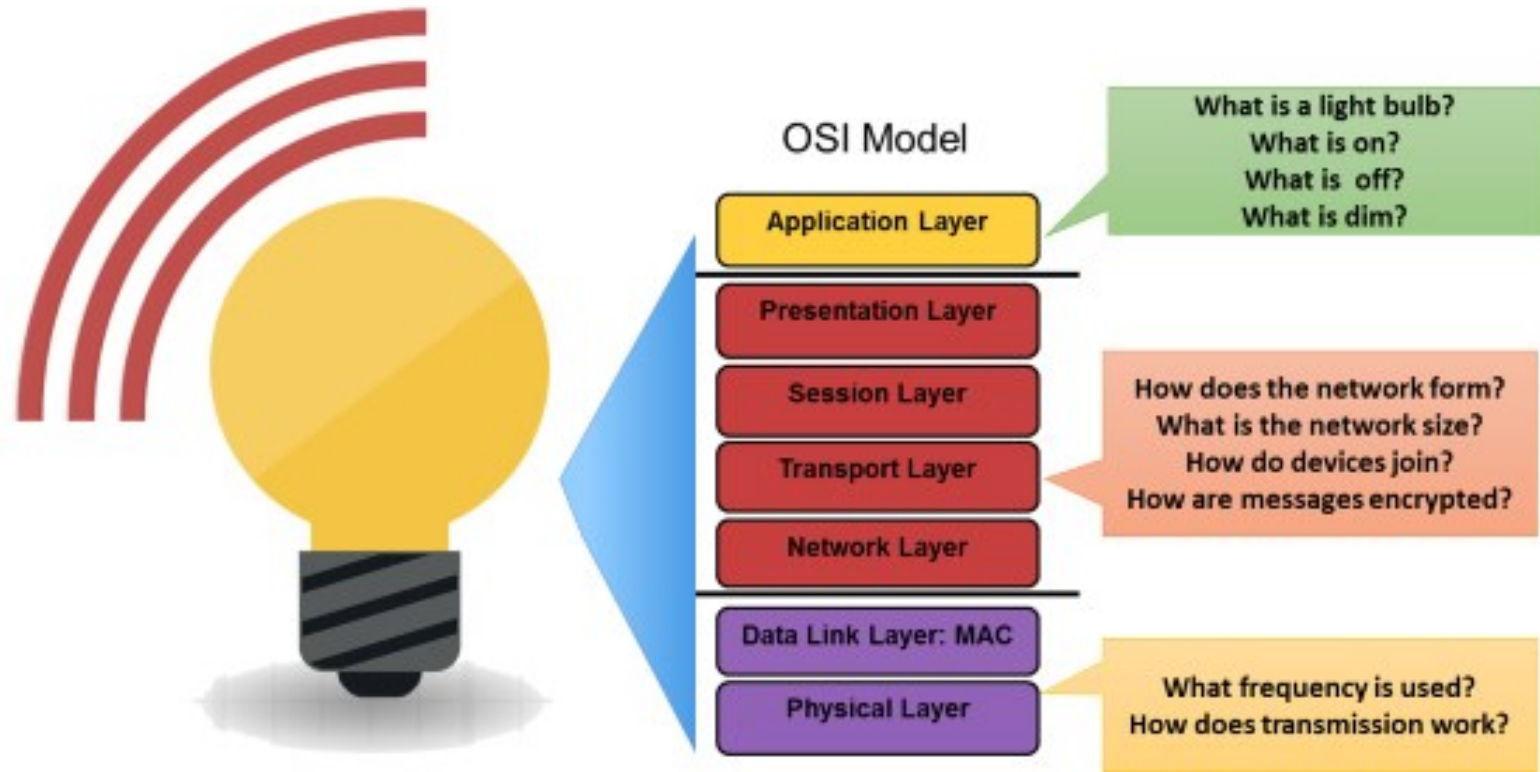
# The range of IoT-equipped devices: from C-IoT to I-IoT



Source: Based on Goldman Sachs Global Investment Research. Additional analysis by WMG



# Technical Architecture for IoT





## The IoT will extend across national borders

*How will we regulate such IoT data in global supply chains?*

Elements of the value chain  
spread across many countries

e.g. smart cars:

Connected cars made  
in one country ...



... but sold globally with  
sensors, connectivity,  
data, and analytics





## Data localisation is pervasive ...

| Policy Rationale                    | Countries Requiring Localisation   |
|-------------------------------------|--|
| Users' privacy and security         | Australia, Brazil, China, EU, France, Germany, Indonesia, Malaysia, Russia, South Korea, Vietnam |
| Foreign surveillance                | Brazil, Canada, China, France, Germany, India, Russia  |
| National Security / Law Enforcement | China, France, Indonesia, India, Russia, South Korea, Vietnam                                    |
| Economic Development                | France, Nigeria  |
| National sovereignty                | Indonesia  |

Source: Chandler and Le, July 2017



## Does data localization increase security?



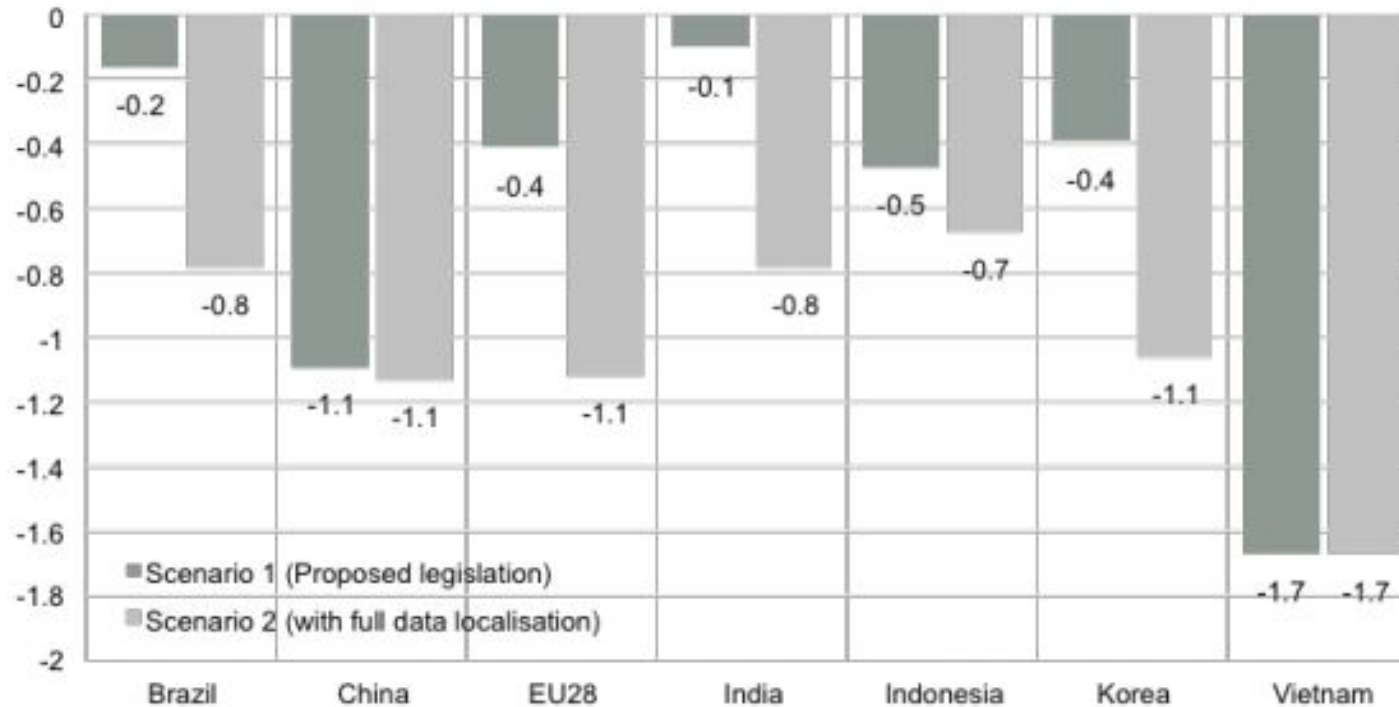
No. Requiring local storage of personal data:

- (i) would not prevent foreign intelligence agencies from accessing it; and
- (ii) would weaken users' protection by concentrating data within a single jurisdiction, making it more susceptible to security breaches and natural disasters than if it were dispersed across many jurisdictions.





## Big Costs from Localising Data (1)

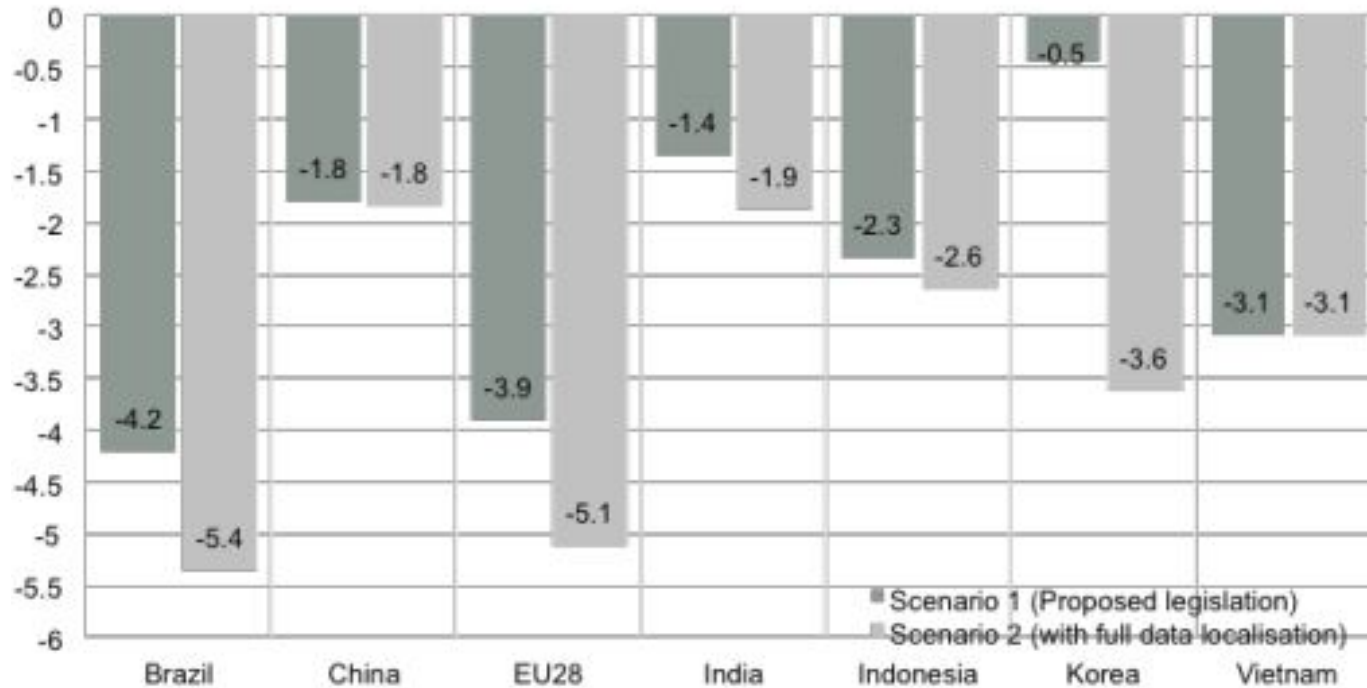


Annual % hit to GDP, by country, from proposed laws and full localisation

Source: ECIPE CGE Simulations, August 2014



## Big Costs from Localising Data (2)



Annual % hit to investment, by country, from proposed laws and full localisation

Source: ECIPE CGE Simulations, August 2014





# Regulatory framework for the Internet of Things

*Three messages from the GSMA for policy makers:*

| Principle | GSMA's Position  | GSMA's Initiatives   |
|-----------|--|--|
| 1         | Support investment and innovation via <b>interoperable solutions</b> to reduce deployment costs and facilitate scalability | Mobile IoT initiative in LPWA is an example of industry-led interoperable standards                                  |
| 2         | Choose <b>flexibility</b> over mandated and specific models of deployment  | Remote SIM provisioning shows a flexible solution, tailored to IoT service providers' needs                          |
| 3         | Foster consumer trust in IoT via industry-led <b>self-regulation</b> and risk management in privacy and security           | The GSMA's privacy toolkit and IoT security guidelines exemplify industry-led solutions to IoT privacy and security. |



## Regulatory approach to protect IoT



Hackable networked homes, kitchen appliances, door locks, pacemakers, cars – a lot to keep track of



## Regulatory approach to maintain IoT

**Visual Navigation**  
Google Maps



**Shared Transportation**  
Mobike



**Home Temperature**  
Nest



**Predictive Maintenance**  
Samsara



**Fitness Tracking**  
Motiv



**Precision Cooking**  
Joule



Who maintains the code if vendor discontinues support or goes bust?

- Make interoperable
- Requirement of a performance bond



## New security challenges require new best practices

### Companies need to ensure ...

| AVAILABILITY   | IDENTITY  | PRIVACY  | INTEGRITY   |
|--|---|--|---|
| Ensuring constant connectivity between Endpoints and their respective services | Authenticating Endpoints, services, and the customer or end-user operating the Endpoint | Reducing the potential for harm to individual end-users. | Ensuring that system integrity can be verified, tracked, and monitored. |

### ... in services and devices with these characteristics:

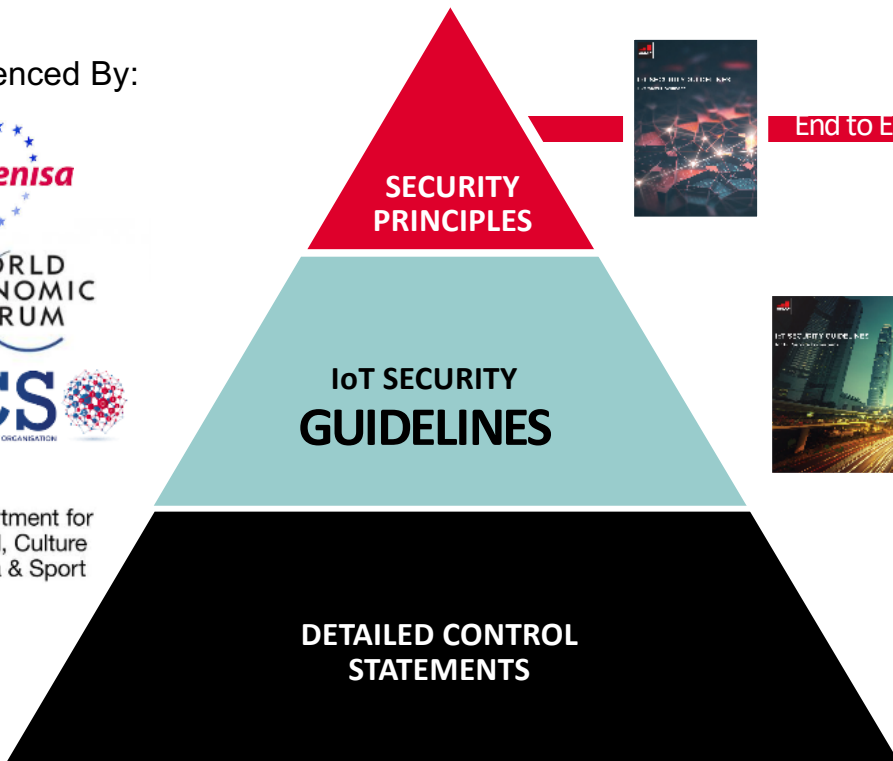
| LOW COMPLEXITY  | LOW POWER   | LONG LIFECYCLES   | PHYSICALLY ACCESSIBLE   |
|---|---|---|---|
| <ul style="list-style-type: none"><li>→ Low processing capability.</li><li>→ Small amounts of memory.</li><li>→ Constrained operating system.</li></ul> | <ul style="list-style-type: none"><li>→ No permanent power supply</li><li>→ Possibly permanent, but limited power supply.</li></ul> | <ul style="list-style-type: none"><li>→ Requires cryptographic design that lasts a lifetime.</li><li>→ Manage security vulnerabilities that can't be patched within the endpoint.</li></ul> | <ul style="list-style-type: none"><li>→ Access to local interfaces inside the IoT endpoint.</li><li>→ Hardware components and interfaces potential target of attackers.</li></ul> |





# GSMA's IoT Security Guidelines

Referenced By:



End to End

Review Component Risk



SERVICE ECOSYSTEM



END POINTS



NETWORK OPERATORS



SECURITY ASSESSMENT CHECK LIST





## Risks of pervasive sensors & monitoring via IoT and AI





# About the GSMA

**THE GSMA**  
WAS FOUNDED IN  
**1987**

**15 OFFICES WORLDWIDE**

|          |               |         |           |              |           |
|----------|---------------|---------|-----------|--------------|-----------|
| SHANGHAI | SAN FRANCISCO | BEIJING | SAO PAULO | NAIROBI      | NEW DELHI |
| LONDON   | DUBAI         | ATLANTA | BRUSSELS  | BARCELONA    | HONG KONG |
|          |               |         | BRASILIA  | BUENOS AIRES |           |

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The world's leading mobile industry events, Mobile World Congress and Mobile World Congress Shanghai, together attract **160,000+** people from across the globe each year

The GSMA works to deliver a regulatory environment that creates value for consumers by engaging regularly with:

|                        |                                 |  |
|------------------------|---------------------------------|--|
| MINISTRIES OF TELECOMS | TELECOMS REGULATORY AUTHORITIES | INTERNATIONAL & NON-GOVERNMENTAL ORGANISATIONS |
|------------------------|---------------------------------|--|

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