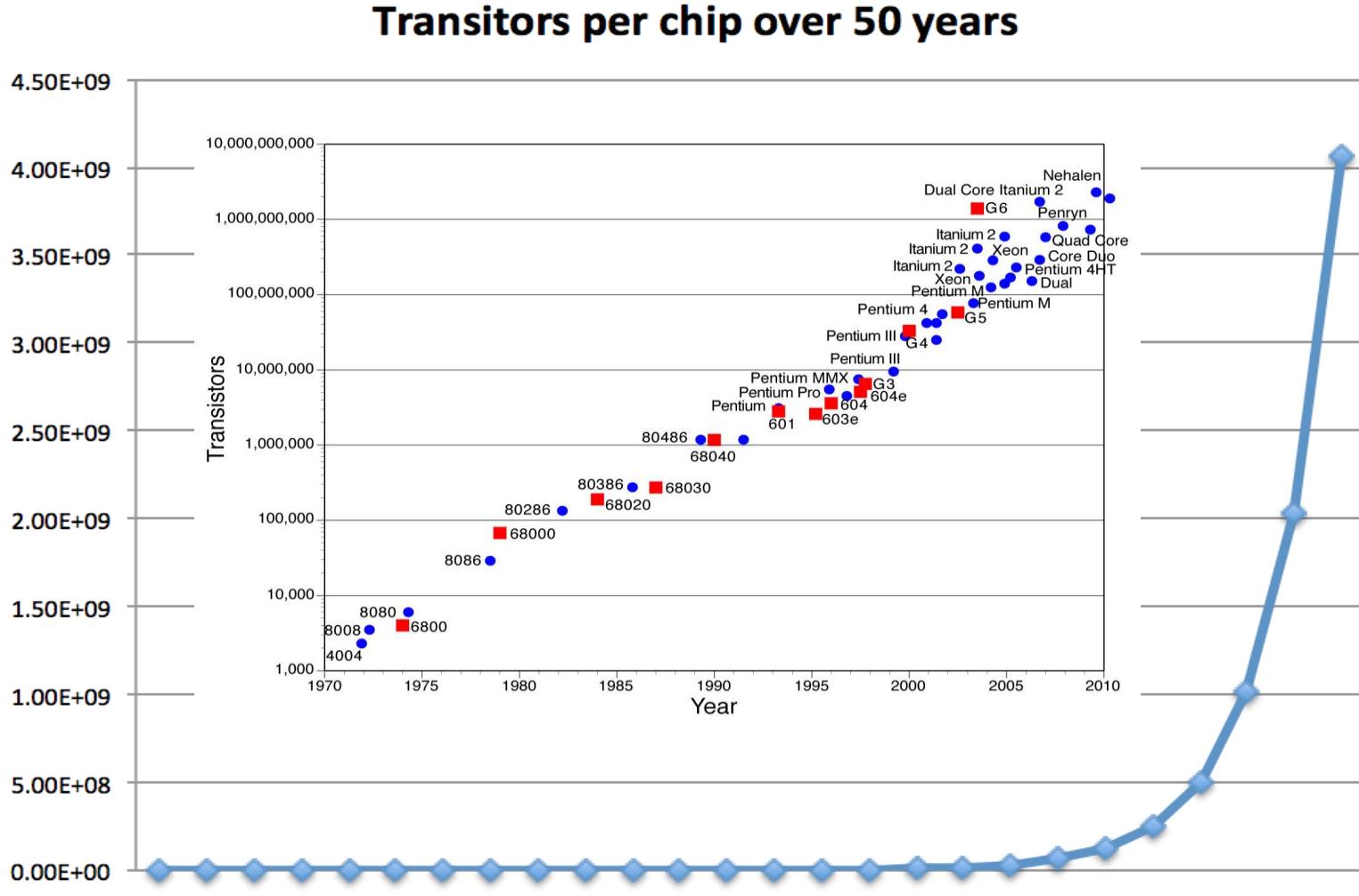


# *La Revolució Tecnològica: Impactes en l'economia i la societat*

*Fòrum de l'Auditor Professional*  
*Juliol 2018*

Xavier Ferràs, MBA, PhD.

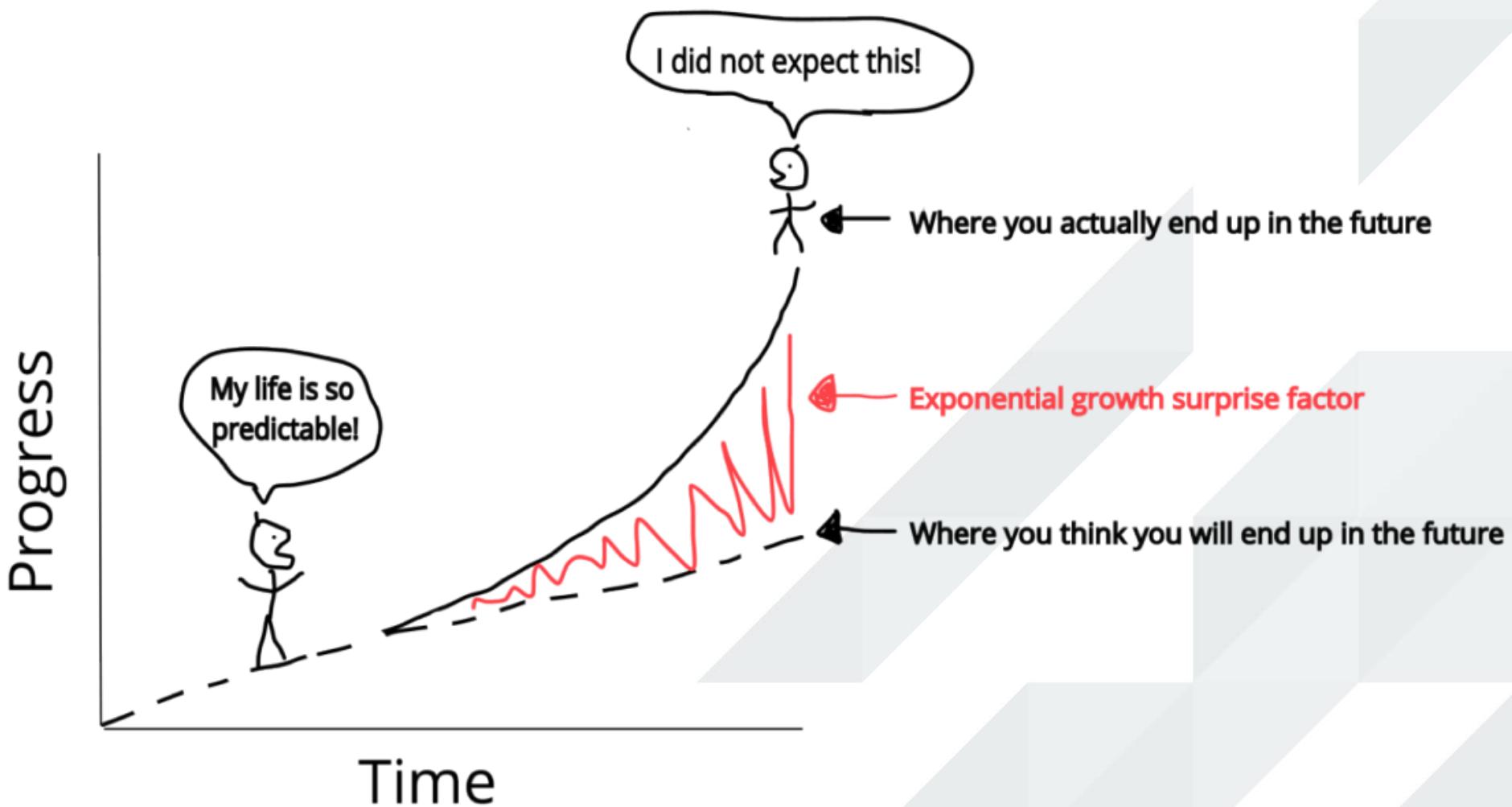
# Digital laws: Moore's law



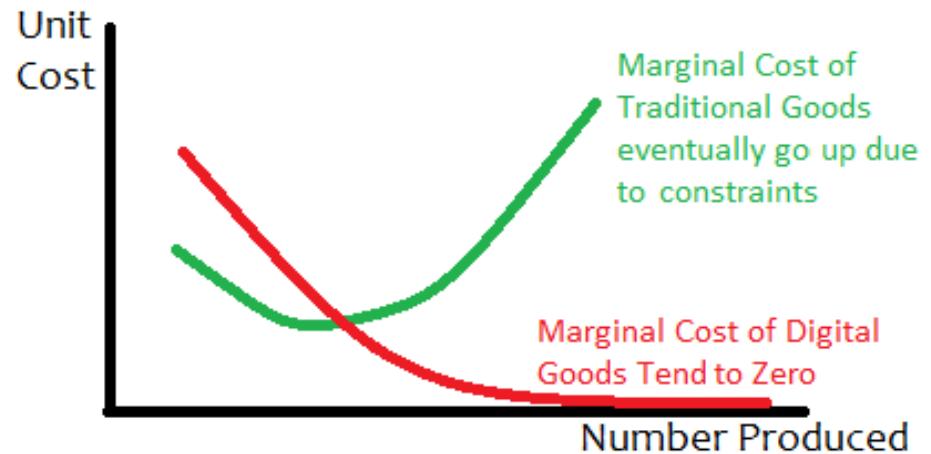
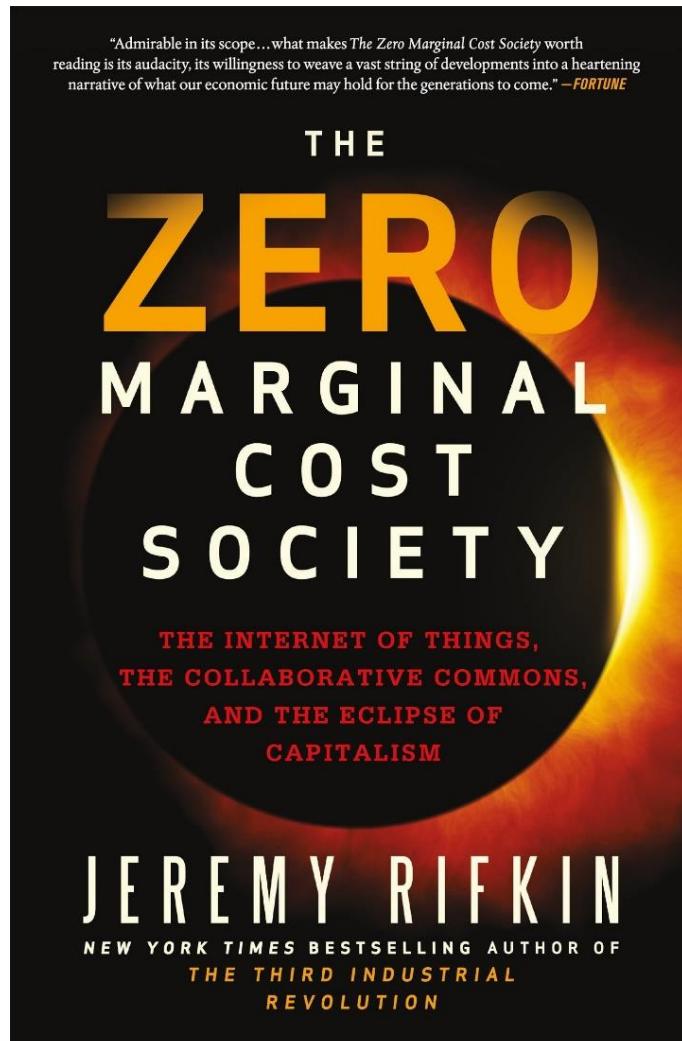
# Digital laws: Moore's law



# Digital laws: Exponential Future



# Digital laws: Zero marginal cost



ZERO MARGINAL COST:  
Towards a “perfect  
competition” market  
structure  
CULMINATION OF  
CAPITALISM?

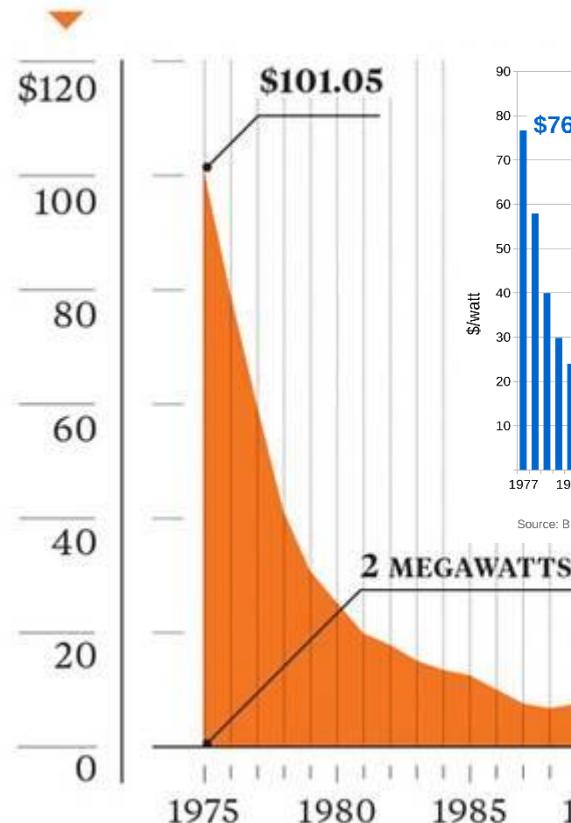
# Tech 4 Good: Abundance of information/ knowledge



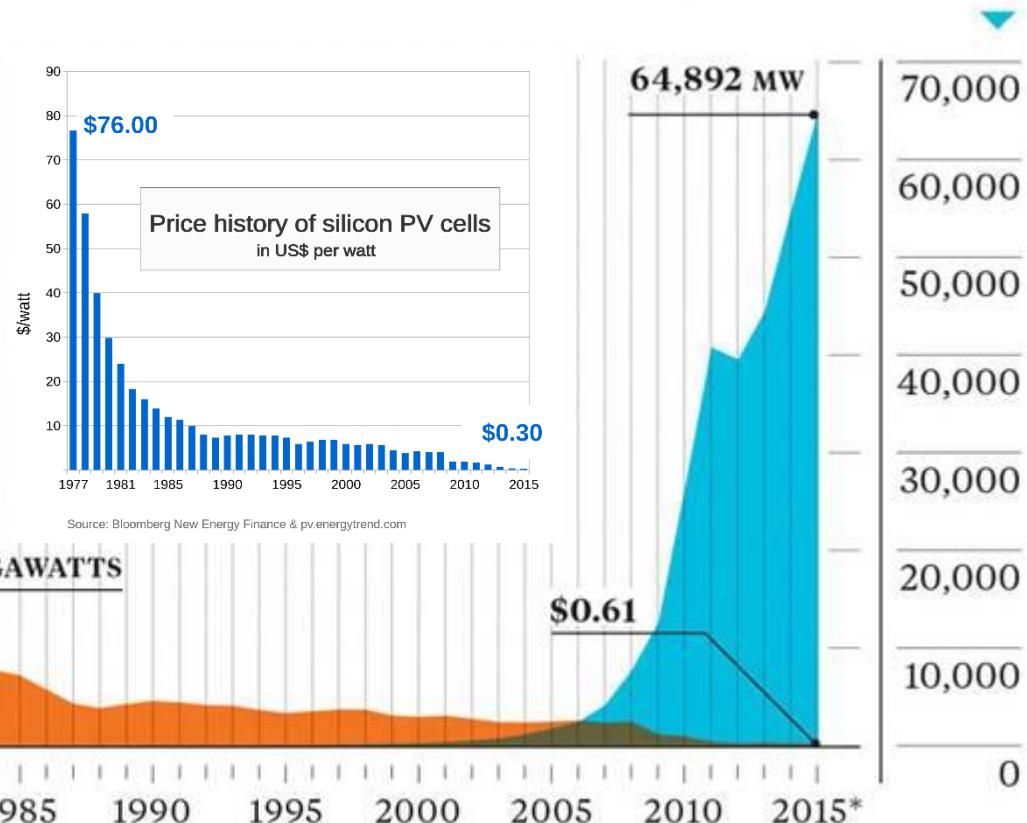
UNIVERSITAT DE VIC  
UNIVERSITAT CENTRAL DE CATALUNYA

# Solar technology

Price of a solar panel per watt



Global solar panel installations





Photographer: Klausjan Bosse/Bloomberg

# Germany Just Got Almost All of Its Power From Renewable Energy

Germany Just Smashed an Energy Record, Generating 85% Electricity From Renewables

Earth & Energy

India Is Scrapping a Major Coal Project in Favor of Renewables

## Solar Could Beat Coal to Become the Cheapest Power on Earth

By Jess Shankleman and Chris Martin  
3 de enero de 2017 1:00 CET Updated on 3 de enero de 2017 13:16 CET

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# Solar technology

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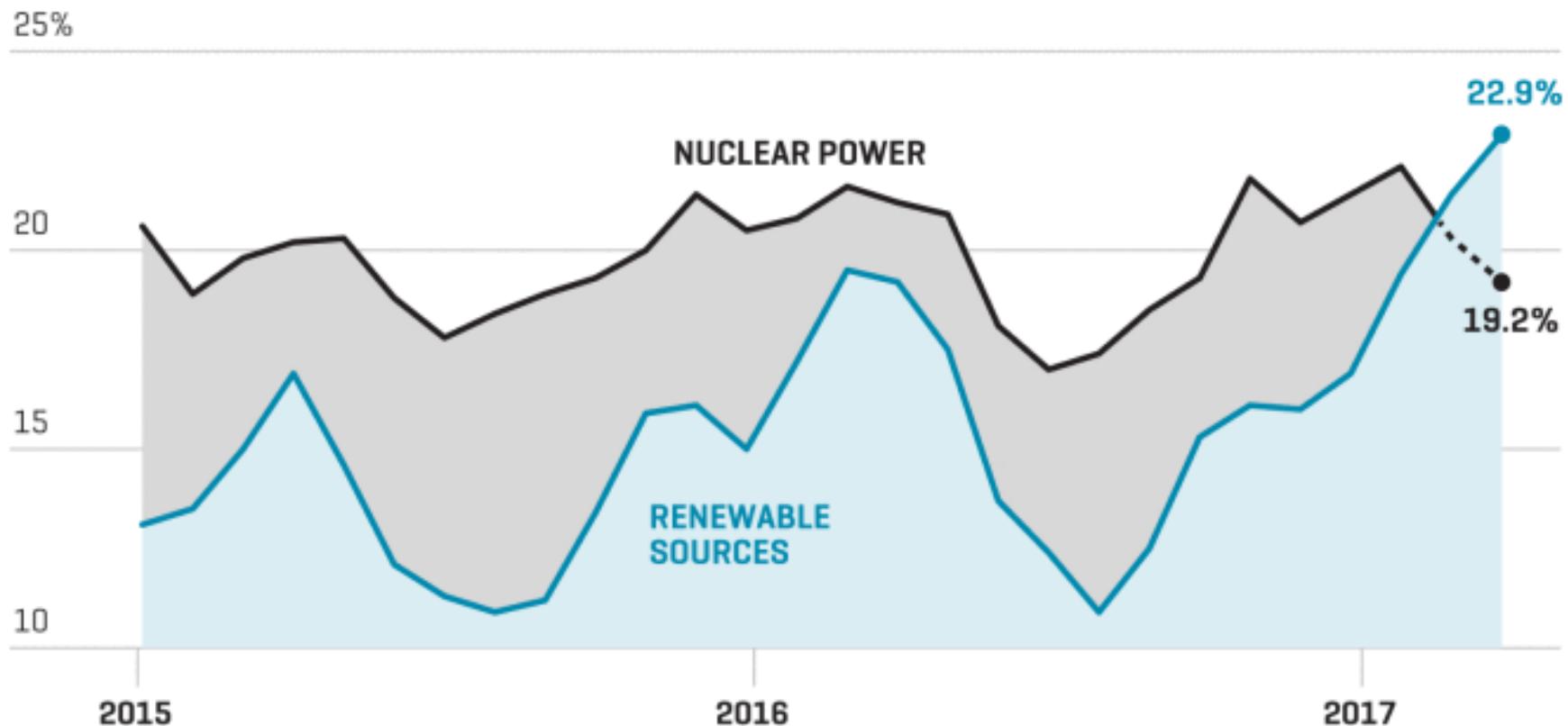
THE SCIENCES MIND HEALTH TECH SUSTAINABILITY EDUCATION VIDEO PODCASTS BLOGS STORE

SUSTAINABILITY

# A Way to the Most Abundant Energy

Viable solar energy has been a long-sought-after goal, but with new and affordable technologies, we might soon be able to make the switch

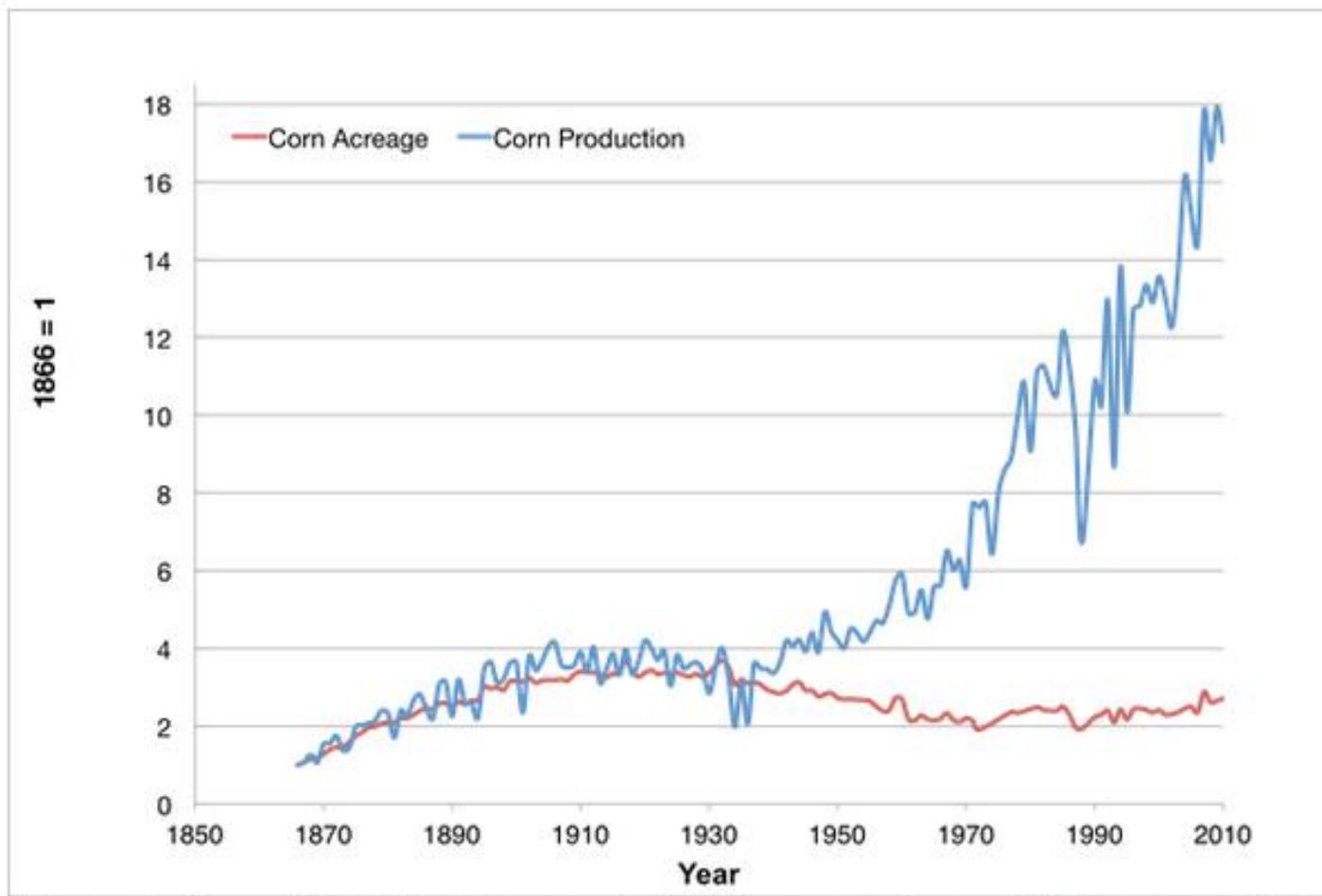
# SOURCES OF U.S. NET ELECTRICAL GENERATION



N. RAPP / FORTUNE MAGAZINE

SOURCE: EIA

# The Food Revolution



**Figure 1:** Decoupling of US corn production from area farmed. Data source: US Census Bureau (1975, 2012).

## “Clean” Meat



believe that in 30 years or so we will no longer need to kill any animals and that all meat will either be clean or plantbased, taste the same and also be much healthier for

# “Clean” Meat or “Fake” Meat?

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x



TECH

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## The battle between the beef industry and Silicon Valley's lab-grown meat startups is heating up

Leanna Garfield [✉](#) [🐦](#)

© Feb. 21, 2018, 4:35 PM [🔥 1,230](#)



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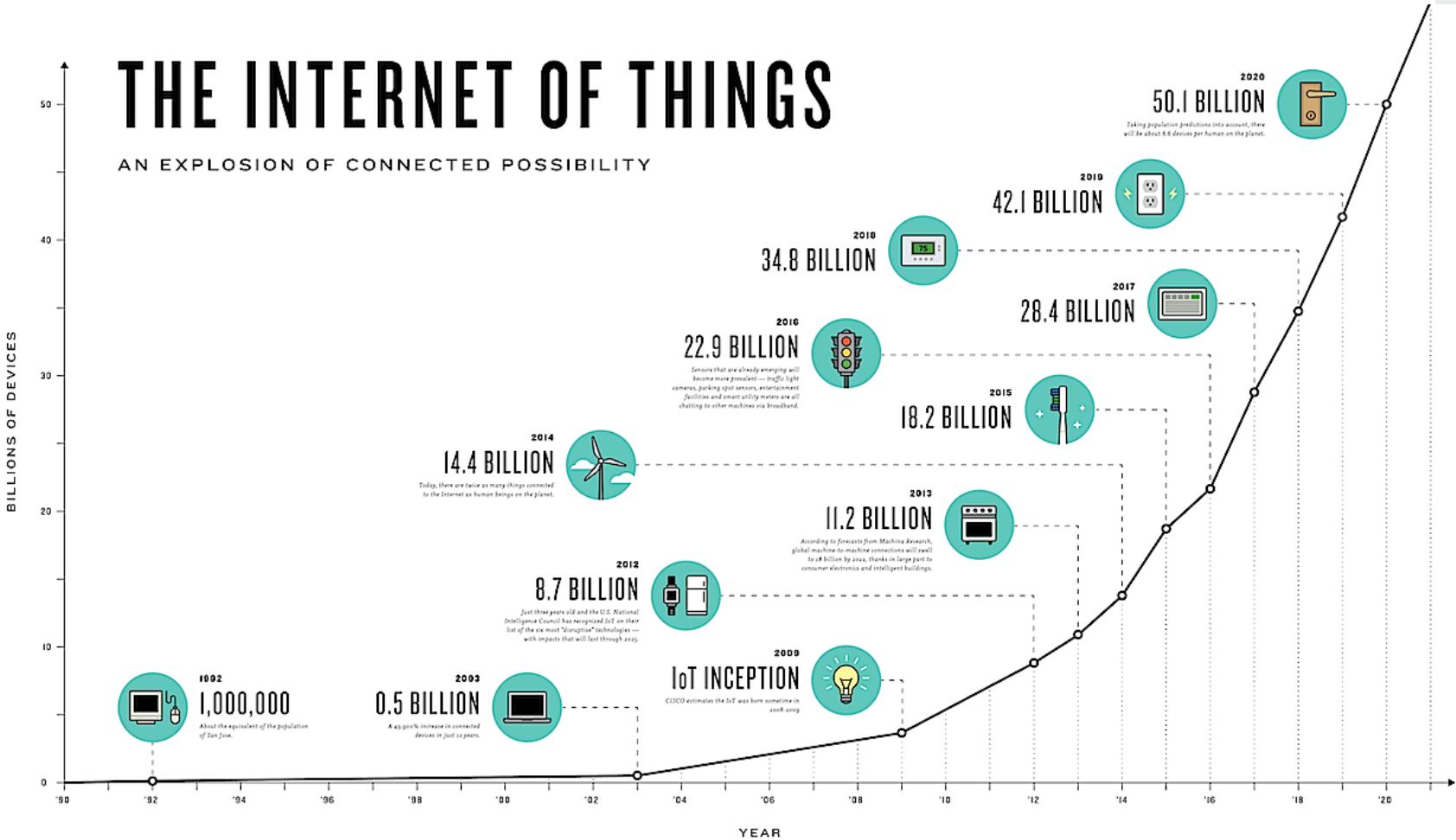
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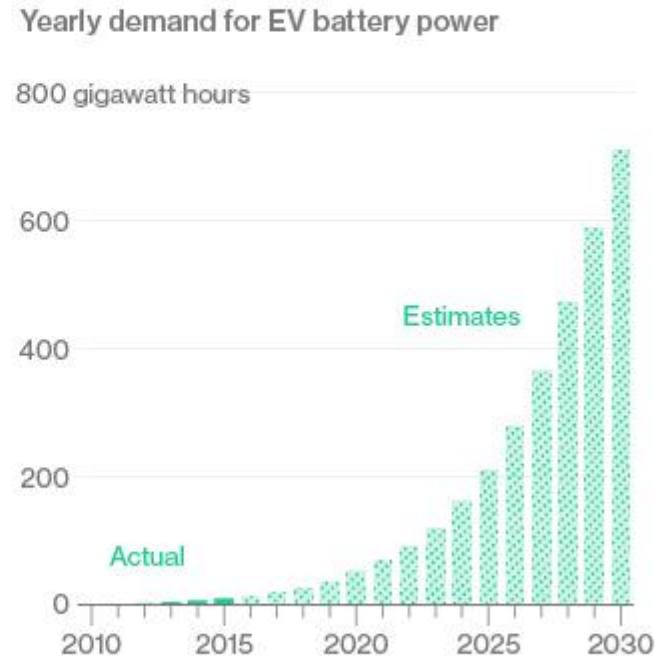
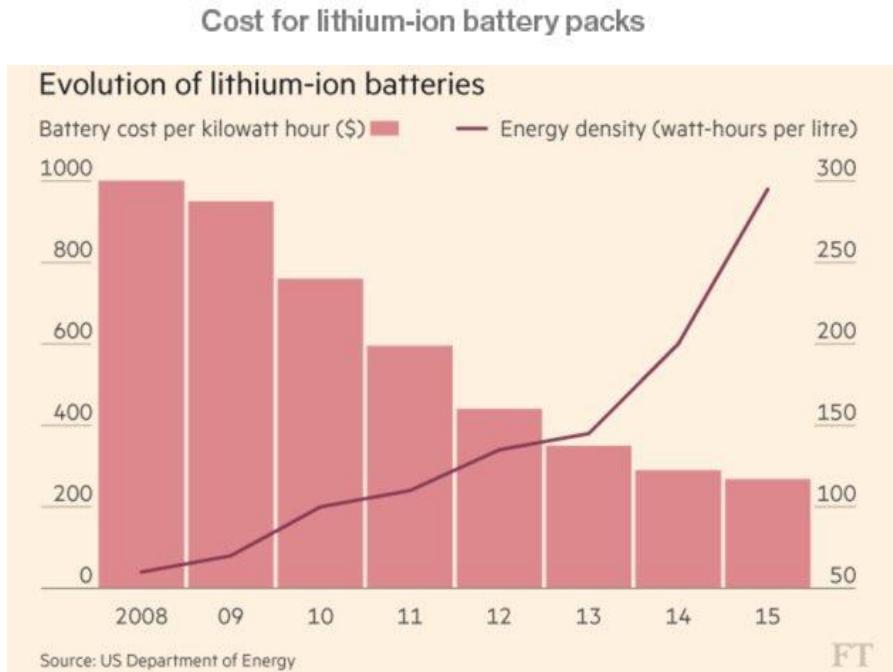
# The Internet of Things



# The automotive industry

## It's All About the Batteries

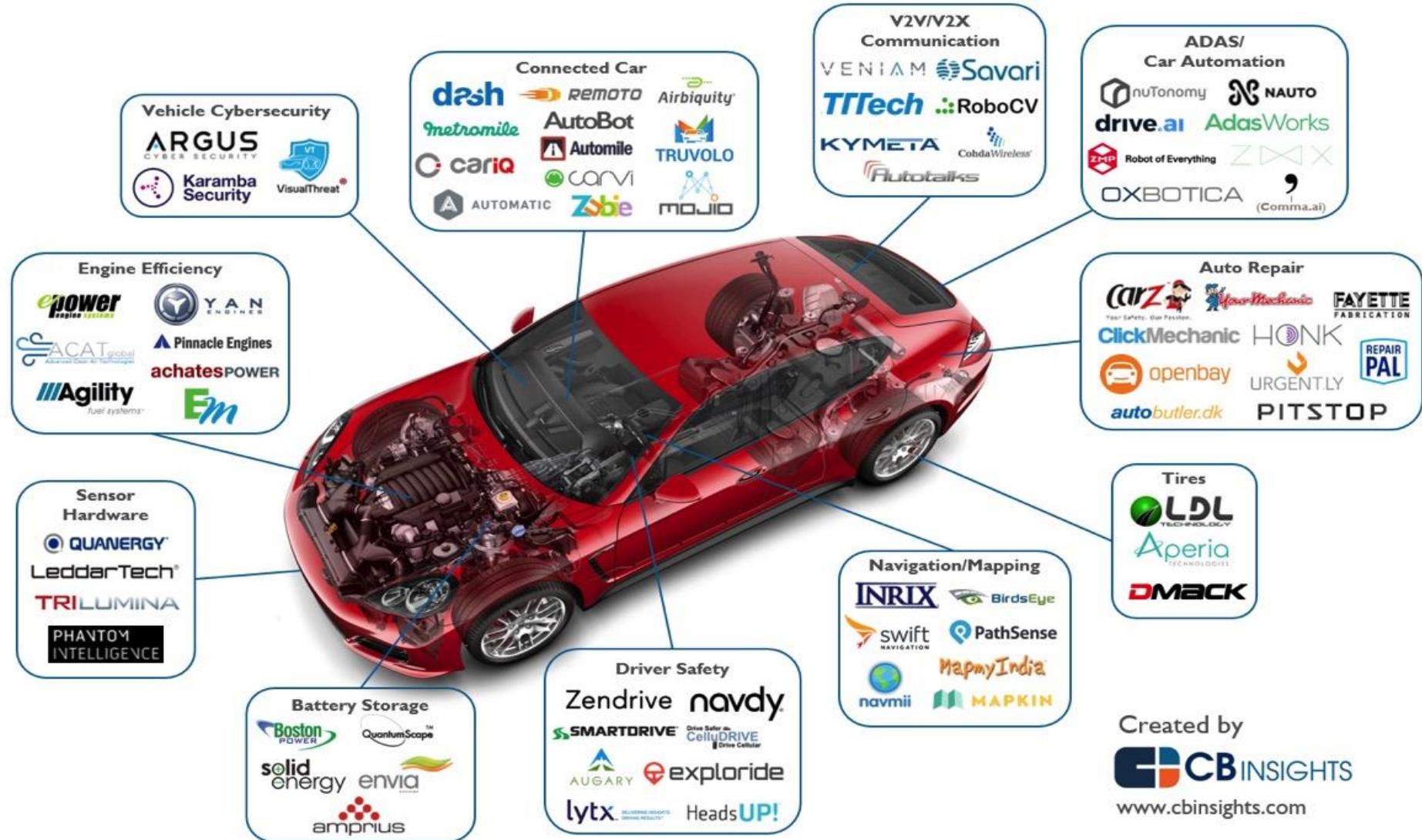
Batteries make up a third of the cost of an electric vehicle.  
As battery costs continue to fall, demand for EVs will rise.



Source: Data compiled by Bloomberg New Energy Finance

Bloomberg

# Unbundling The Automobile



Created by  
**CB INSIGHTS**  
www.cbinsights.com

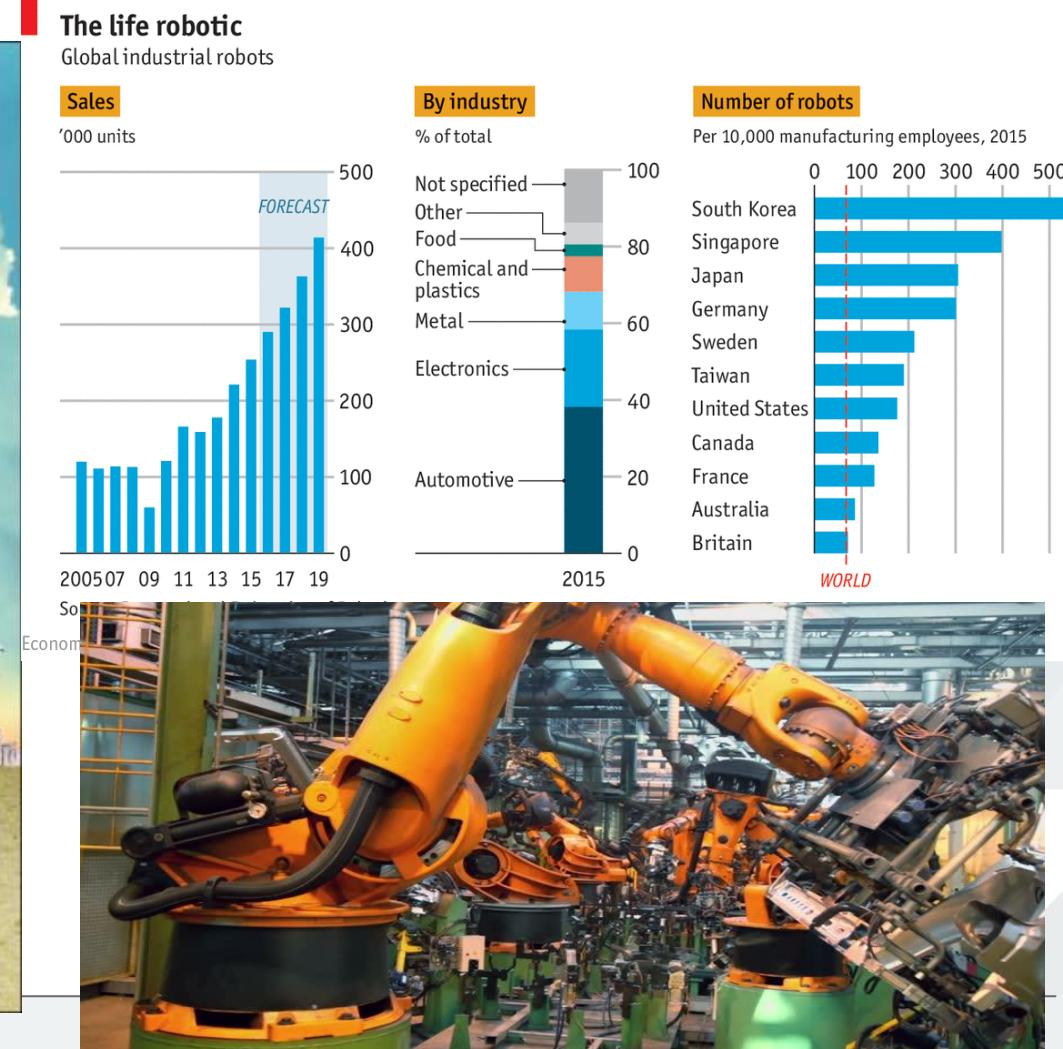
# Industry 4.0 and Advanced Factories (3DP)



- Clean technology
- Almost zero marginal cost
- Sophisticated shapes & geometries
- Possibility to compete in cost & flexibility
- Independence of scale
- Independence of location



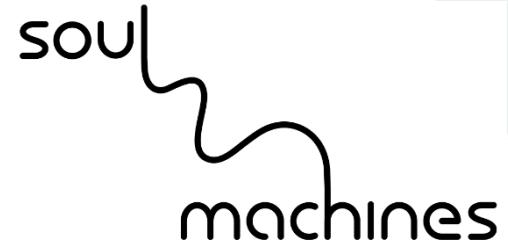
# The Robot Era



# Artificial Intelligence: The Next Big Thing



# Emotional Intelligence Feature: MIT Technology Review



In the news today on MIT Technology Review:

**"Customer Service Chatbots Are About to Become Frighteningly Realistic"**

By: Tom Simonite // March 22, 2017



# Artificial Intelligence: The Next Big Thing

# Google

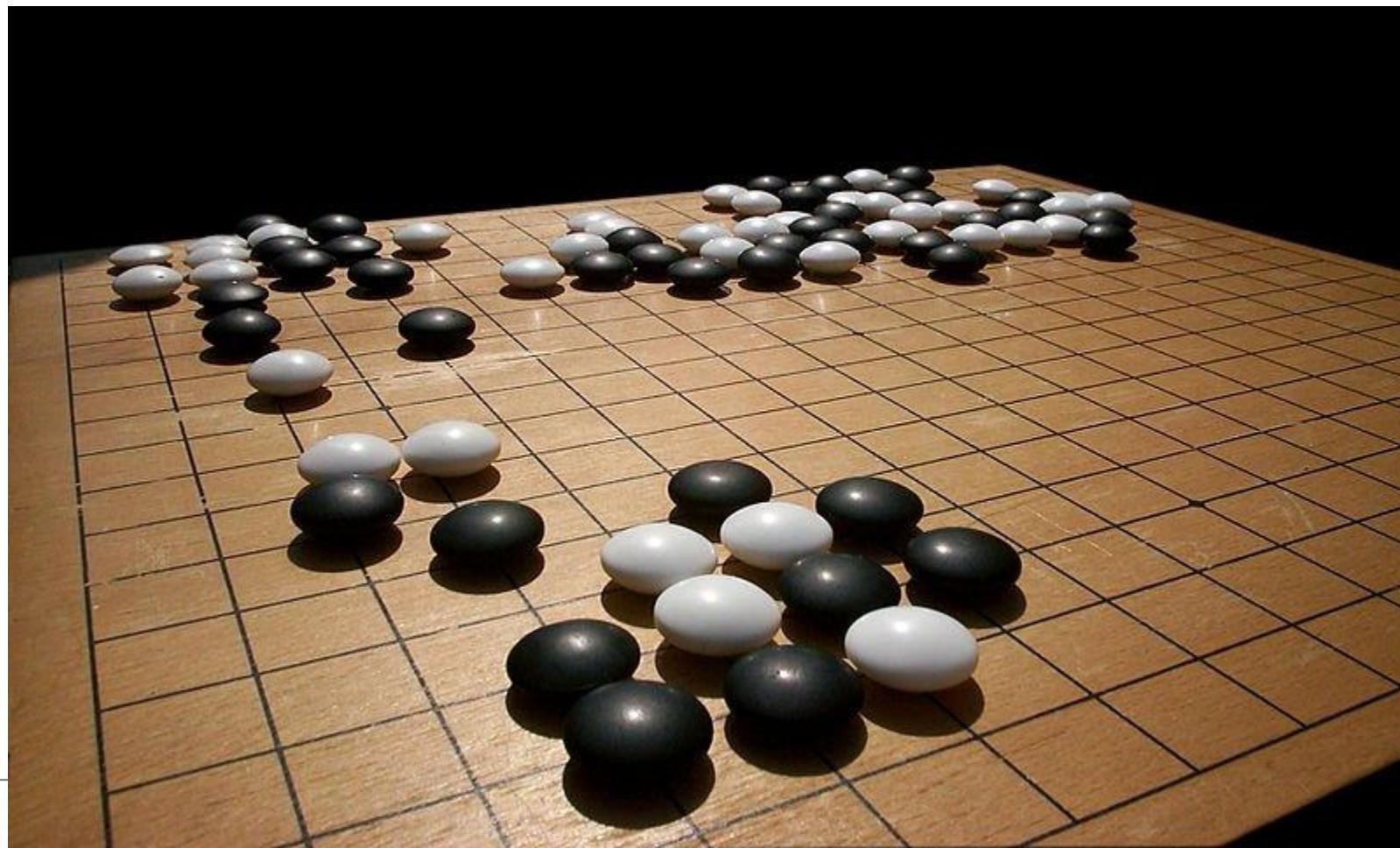


# What about Artificial Strategic Thinking?



# Google AI beats Go world champion again to complete historic 4-1 series victory

Posted Mar 15, 2016 by [Jon Russell \(@jonrussell\)](#)



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# WIRED

CADE METZ BUSINESS 03.16.16 07:00 AM

## IN TWO MOVES, ALPHAGO AND LEE SEDOL REDEFINED THE FUTURE

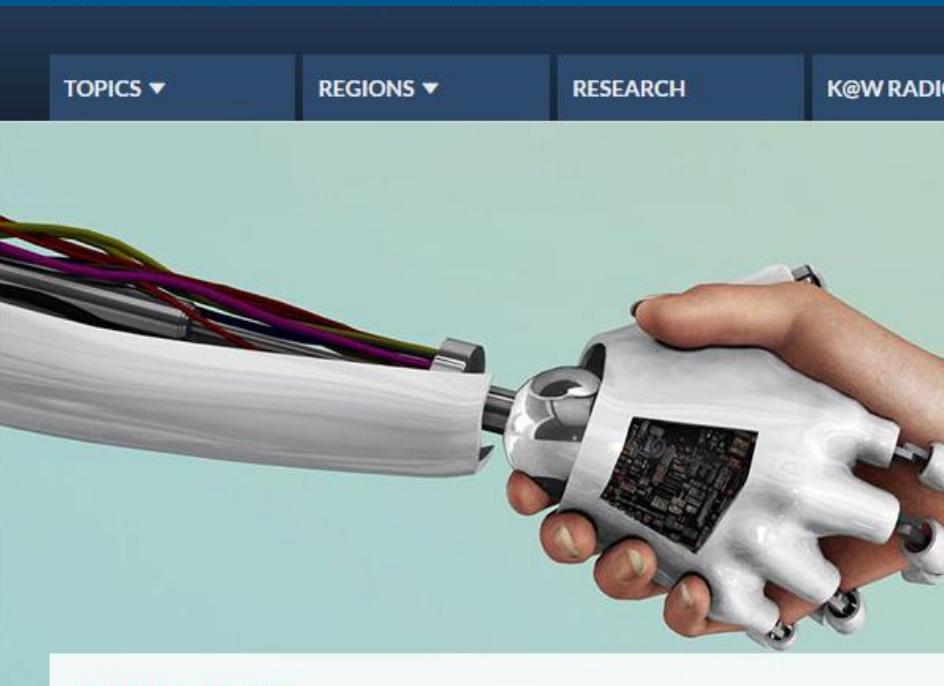


CADE METZ BUSINESS 03.11.16 07:00 AM

## THE SADNESS AND BEAUTY OF WATCHING GOOGLE'S AI PLAY GO



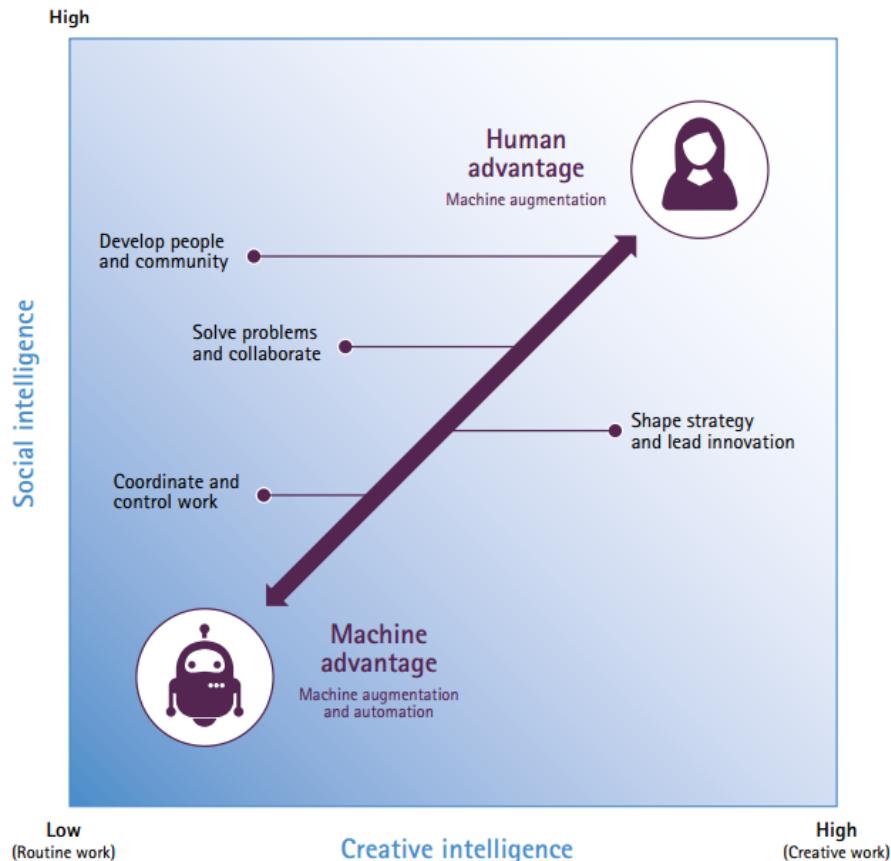
# World's largest hedge fund to replace managers with artificial intelligence



MANAGEMENT

## Can a Robot Be Your Boss?

Insurance firm to replace human workers with  
AI system



# In Japan, an artificial intelligence has been appointed creative director

AI-CD β is a robot that is being treated as an actual employee in an ad agency.

Advertising and media are often at the forefront of new technology, and we have already seen augmented reality platforms showing content in the real world and a virtual reality advertising network for brands.

Now an artificial intelligence robot, AI-CD β, developed by Japanese advertising and marketing agency McCann Japan, is set to work on providing new creative direction for commercials. The AI will give input on projects, mining and analyzing creative databases of adverts to find the best commercials for products

and messages.

The AI-CD β can work through far more historical adverts and commercials than any human advertising creative, and can therefore aid its colleagues in the development of ads for clients. But the robot is also being treated as part of the team at McCann, taking the title of "creative director" and attending the opening ceremony for new company employees.

McCann Japan CEO Yasuyuki Katagi said: "Artificial intelligence is already being used to create a wide variety of

entertainment, including music, movies, and TV drama, so we're very enthusiastic about the potential of AI-CD β for the future of ad creation. The whole company is 100 percent on board to support the development of our AI employee."

How else could artificial employees be used to complement, rather than compete, with human co-workers?



## At a Glance

### WHAT

Ross Intelligence, which is built on IBM's super-computer Watson, uses natural language processing to answer legal questions.

### WHO

Ross Intelligence

### WHERE

United States

### CONTACT

[www.rossintelligence.com](http://www.rossintelligence.com)  
[team@rossintelligence.com](mailto:team@rossintelligence.com)

## AI lawyer speeds up legal research

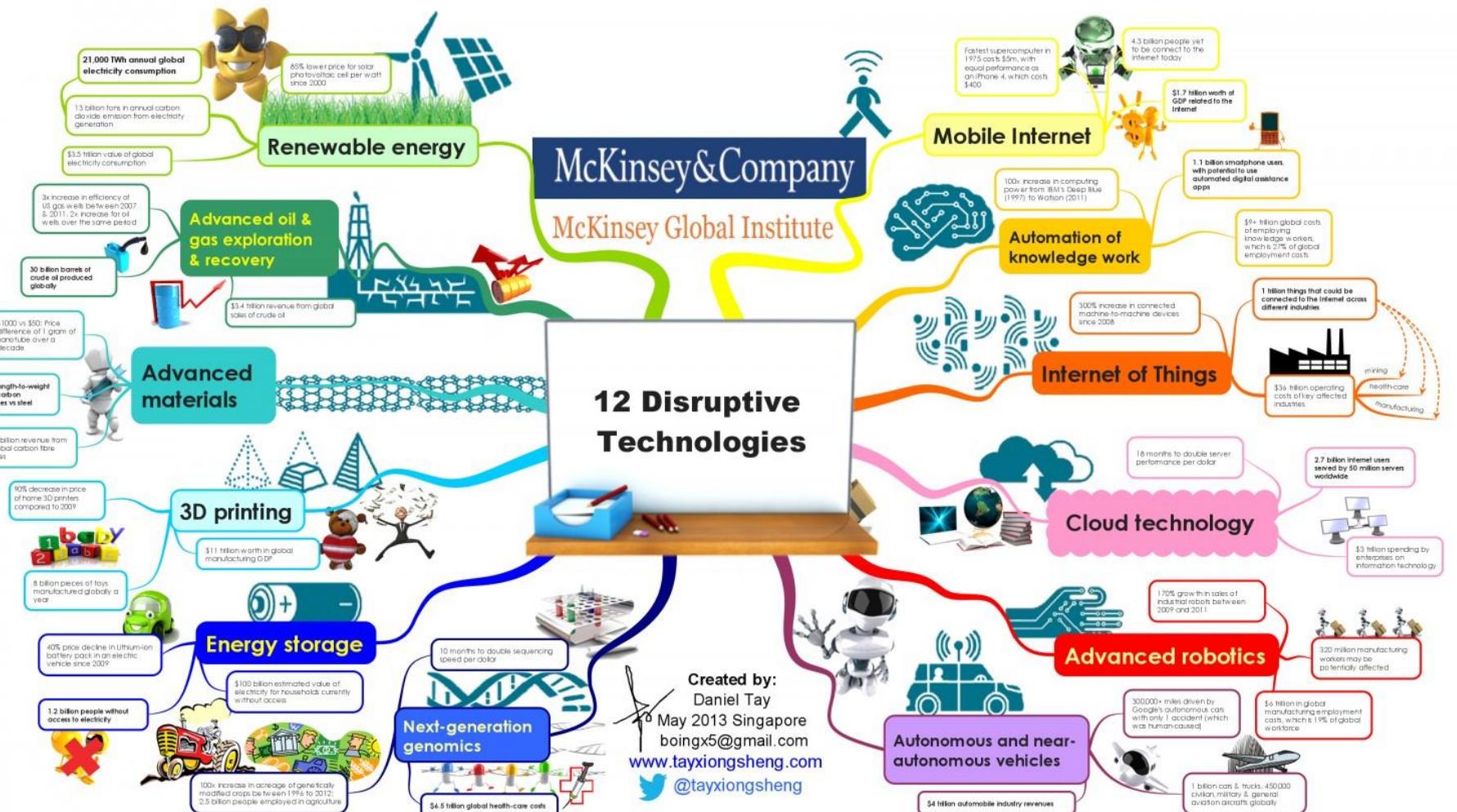
Ross Intelligence, which is built on IBM's super-computer Watson, uses natural language processing to answer legal questions.

Lawyers have to maintain and recall vast amounts of information in the form

program reads through the entire body of law and returns a cited answer



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# A World of Abundance?



In 100 years:

Average human lifespan x2

Average per capita incoming  
x3

Childhood mortality /10

Cost of food /10

Cost of electricity /100

Cost of communications /1000

Abundance of information/  
education/ energy/  
food/social relationships/  
health/ transport...

# The advent of the Distribution Era

## The second economy

W. Brian Arthur

Digitization is creating a second economy that's vast, automatic, and invisible—thereby bringing the biggest change since the Industrial Revolution.

**W. Brian Arthur** is a visiting researcher with the Intelligent Systems Lab at the Palo Alto Research Center (PARC) and an external professor at the Santa Fe Institute. He is an economist and technology thinker and a pioneer in the science of complexity. His 1994 book, *Increasing Returns and Path Dependence in the Economy* (University of Michigan Press, December 1994), contains several of his seminal papers. More recently, Arthur was the author of *The Nature of Technology: What It Is and How It Evolves* (Free Press, August 2009).

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[quarterly.comments@mckinsey.com](mailto:quarterly.comments@mckinsey.com).

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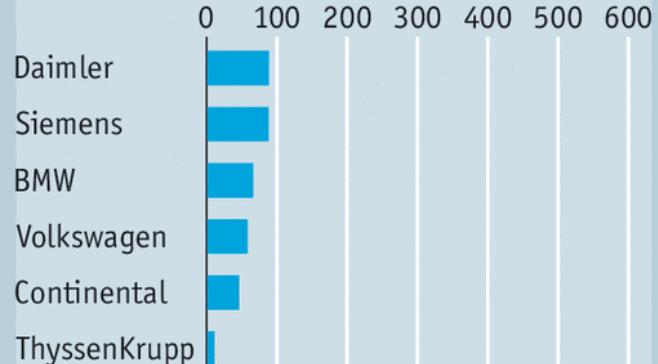
### Tech titans, manufacturing midgets 2

Company valuations\*, \$bn

US technology firms



German manufacturing firms



Source: Thomson Reuters

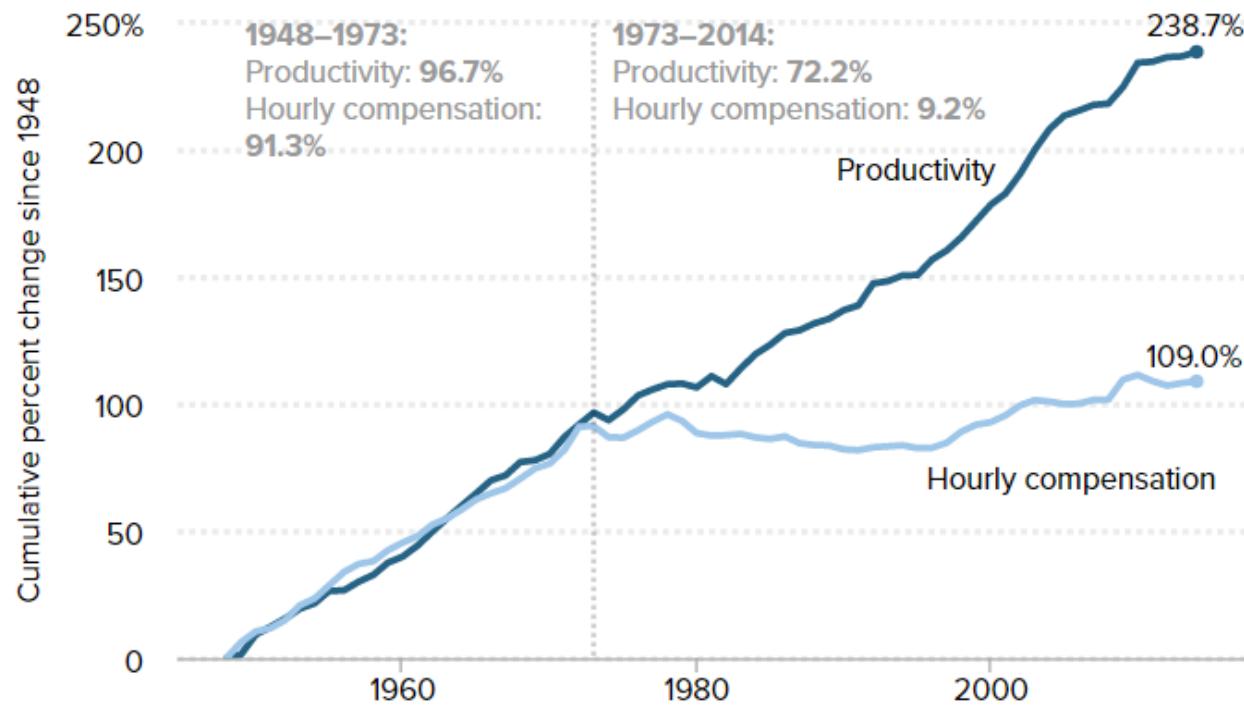
\* At November 17th 2015

Economist.com

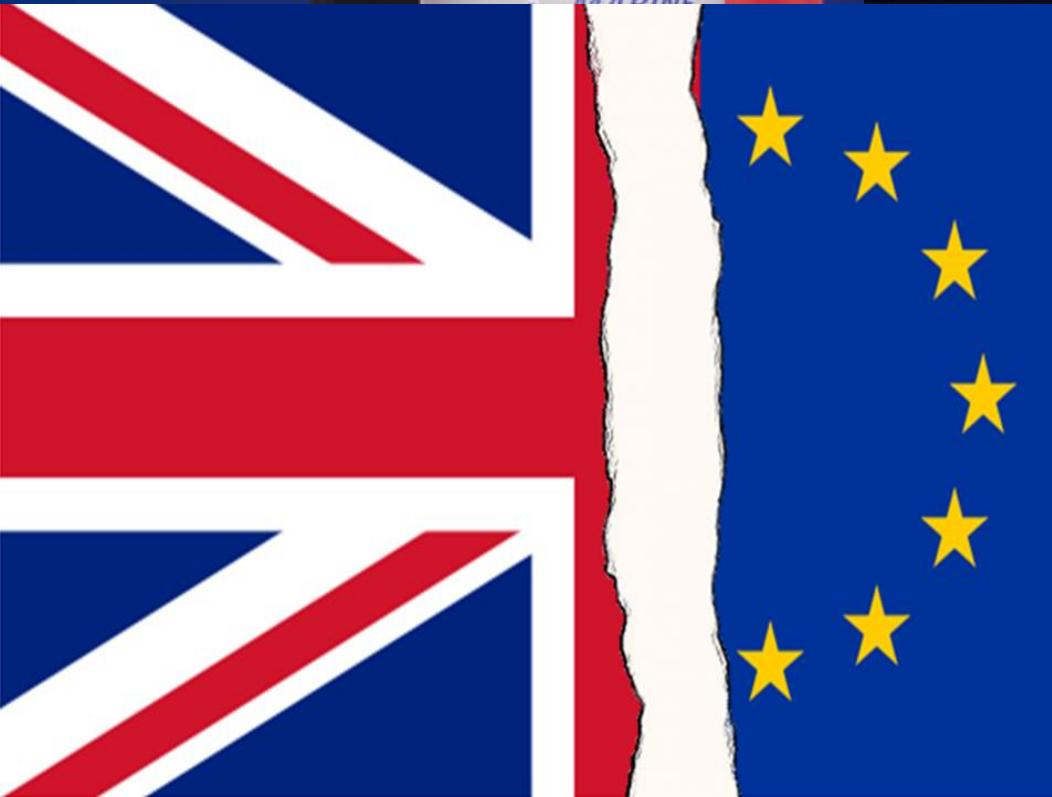
# Mass unemployment & inequality

FIGURE A

## Disconnect between productivity and a typical worker's compensation, 1948–2014

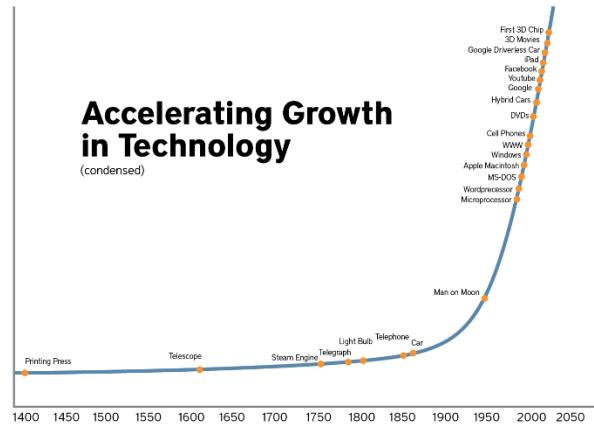


Source: Economic Policy Institute



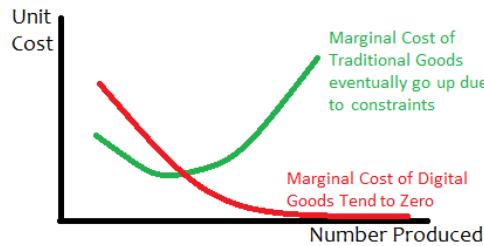
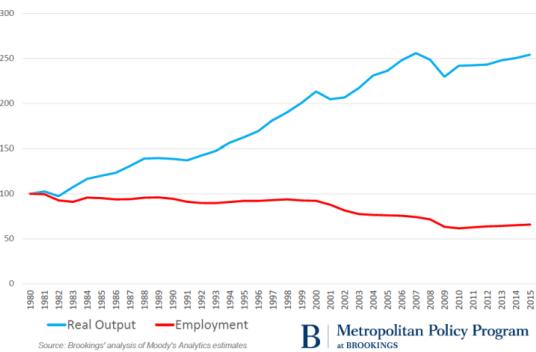
## Accelerating Growth in Technology

(condensed)



## More Output, Less Employment

The manufacturing sector has gotten more productive, while giving fewer people jobs (normalized as a percent of levels in 1980).



# ABUNDANCE

# INEQUALITY

# The distribution problem



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## Universal basic income has support from some big names



A look at some of the entrepreneurs who have supported universal basic income.

Image: REUTERS/Rashid Umar Abbasi

FUTURE OF WORK

# Bill Gates Says Robots Should Be Taxed Like Workers

David Z. Morris

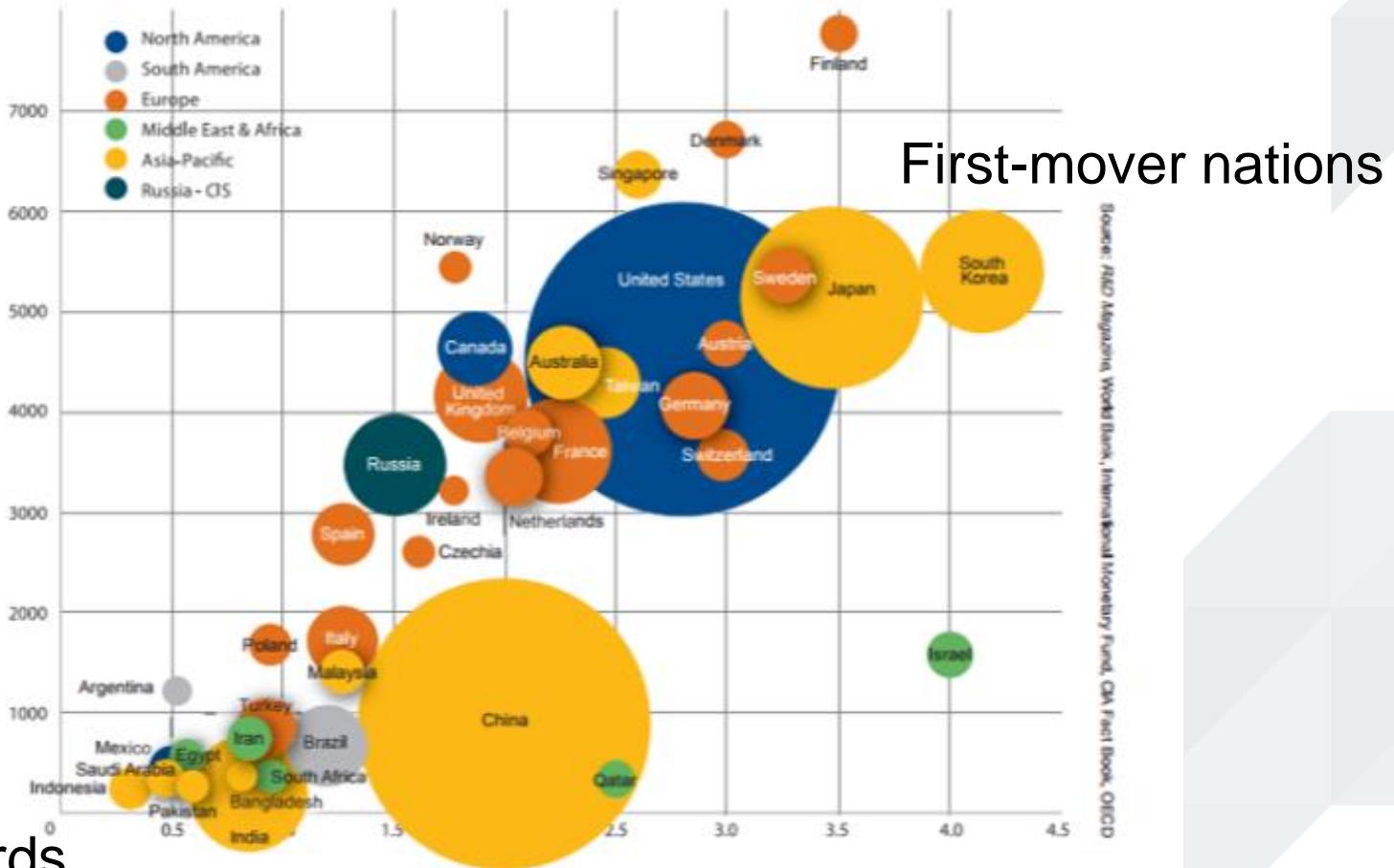
Feb 18, 2017



In a new [interview with Quartz, Microsoft](#) founder Bill Gates makes a rather stunning argument—that robots who replace human workers should incur taxes equivalent to that worker's income taxes.

“Right now, the human worker who does, say, \$50,000 worth of work in a factory that income is taxed. If a robot comes in to do the same thing, you’d

# The value-creation problem



Laggards

The size of the circles in this Chart reflects the relative amount of annual R&D spending by the indicated country. Note the regional grouping of countries by the colors of the balls. The horizontal axis reflects R&D spending as a percent share of the countries' GDP (gross domestic product). The vertical axis reflects the number of researchers (including scientists and engineers) per million population for the respective countries.

R&D Magazine, 2018

# High Tech Clusters

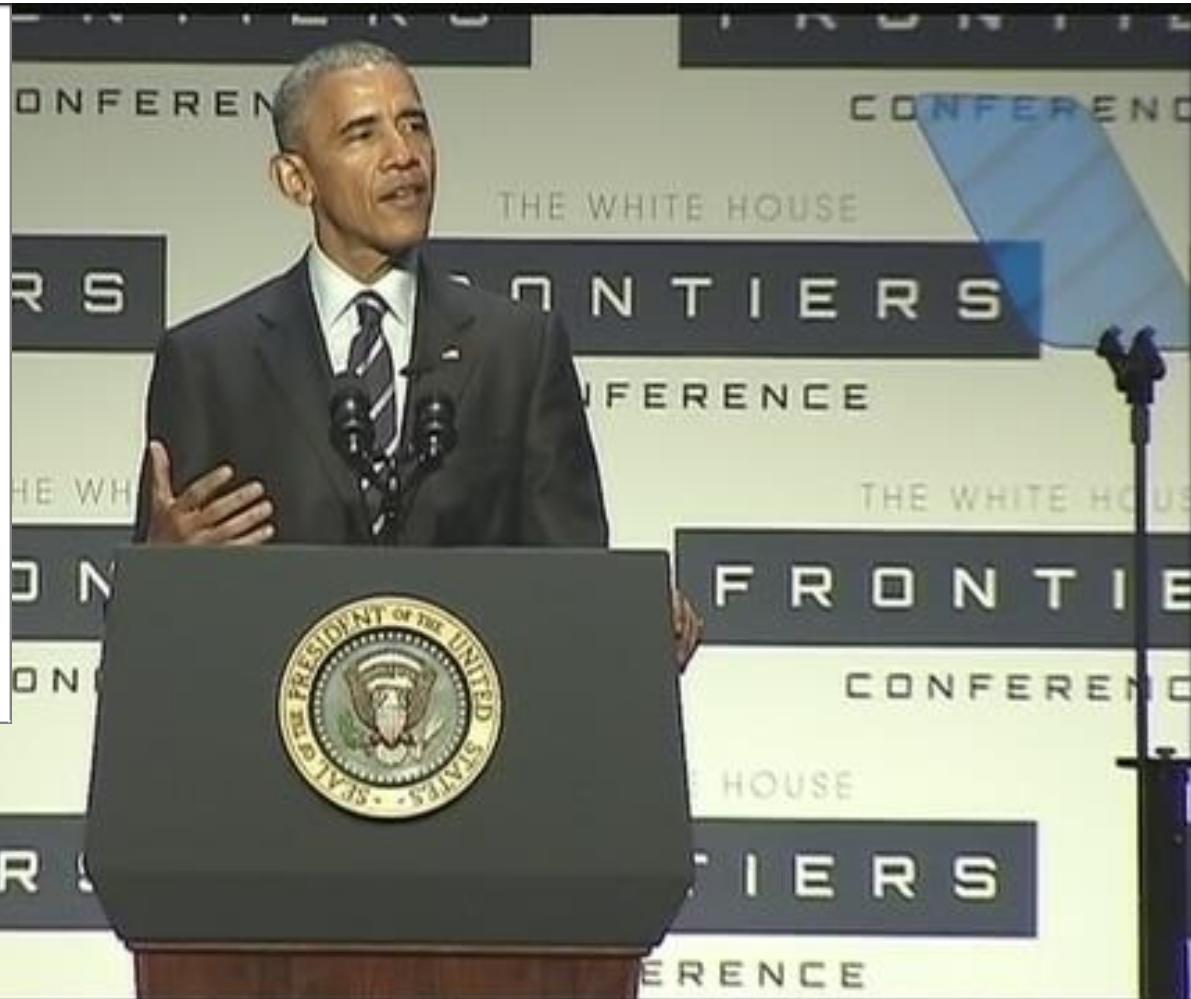
**Table 2: Cluster ranking**

Rank	Cluster name	Territory(ies)	Number of PCT filings
1	Tokyo-Yokohama	Japan	94,079
2	Shenzhen-Hong Kong	China/Hong Kong (China)	41,218
3	San Jose-San Francisco, CA	United States	34,324
4	Seoul	Republic of Korea	34,187
5	Osaka-Kobe-Kyoto	Japan	23,512
6	San Diego, CA	United States	16,908
7	Beijing	China	15,185
8	Boston-Cambridge, MA	United States	13,819
9	Nagoya	Japan	13,515
10	Paris	France	13,461
11	New York, NY	United States	12,215
12	Frankfurt-Mannheim	Germany	11,813
13	Houston, TX	United States	9,825
14	Stuttgart	Germany	9,528
15	Seattle, WA	United States	8,396
16	Cologne-Dusseldorf	Germany	7,957
17	Chicago, IL	United States	7,789
18	Eindhoven	Netherlands/Belgium	7,222
19	Shanghai	China	6,639
20	Munich	Germany	6,578
21	London	United Kingdom	6,548
22	Tel Aviv	Israel	5,659
23	Daejeon	Republic of Korea	5,507
24	Stockholm	Sweden	5,211
25	Los Angeles, CA	United States	5,027

Artificial Intelligence,  
Automation, and the Economy

Executive Office of the President

December 2016





**“I can convince  
my country about  
change precisely  
because I embrace  
it.”**

INTERVIEW WITH WIRED  
THURSDAY, MARCH 29TH, 2018



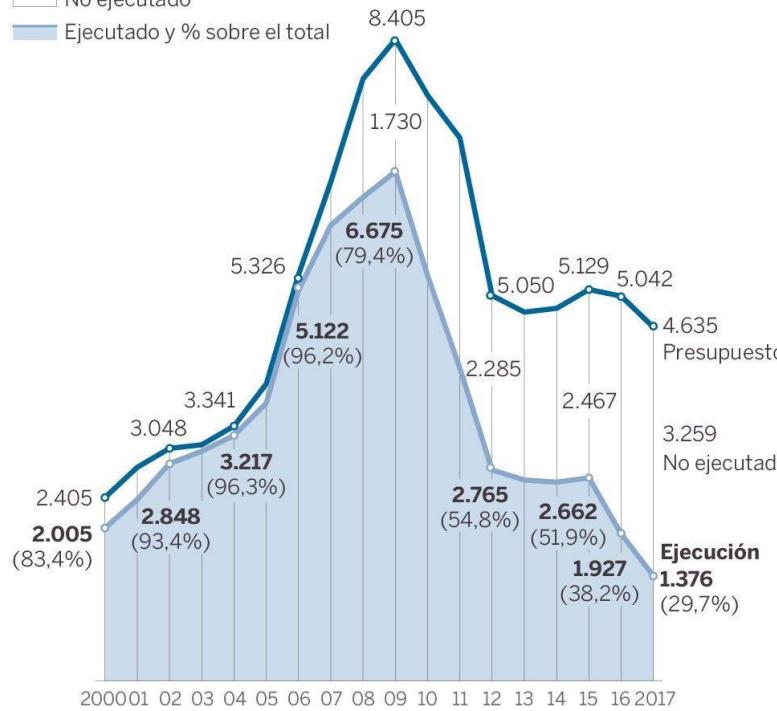
## EJECUCIÓN DEL PRESUPUESTO DEL ESTADO EN INNOVACIÓN

En millones de euros

### — Presupuesto

No ejecutado

#### Ejecutado y % sobre el total

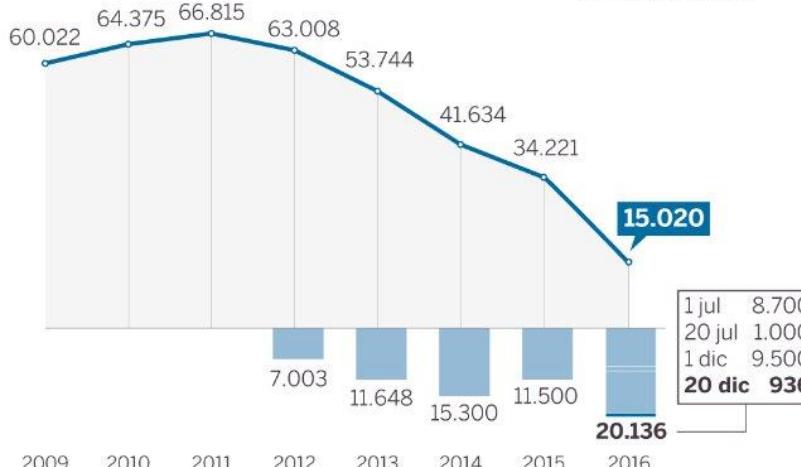


## FONDO DE RESERVA DE LA SEGURIDAD SOCIAL

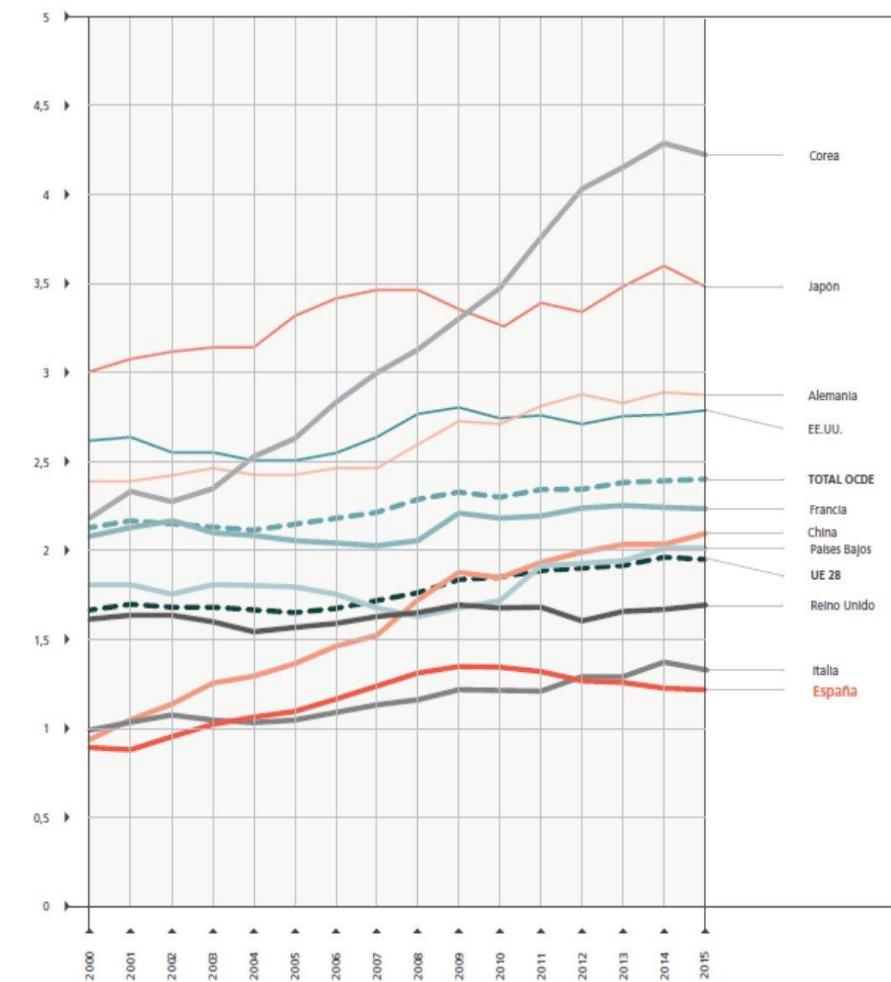
En millones de euros

#### – Fondo acumulado

## ■ Retiradas del fondo de reservas



**Gráfico 58. Evolución del esfuerzo en I+D, en gasto como % PIB. Periodo 2000 a 2015.**



**Thanks for your attention!**  
**Xavier Ferràs**  
**[Xavier.ferras@uvic.cat](mailto:Xavier.ferras@uvic.cat)**  
**@XavierFerras**

**LinkedIn Me!!!!**