

THE FUTURE OF WORK

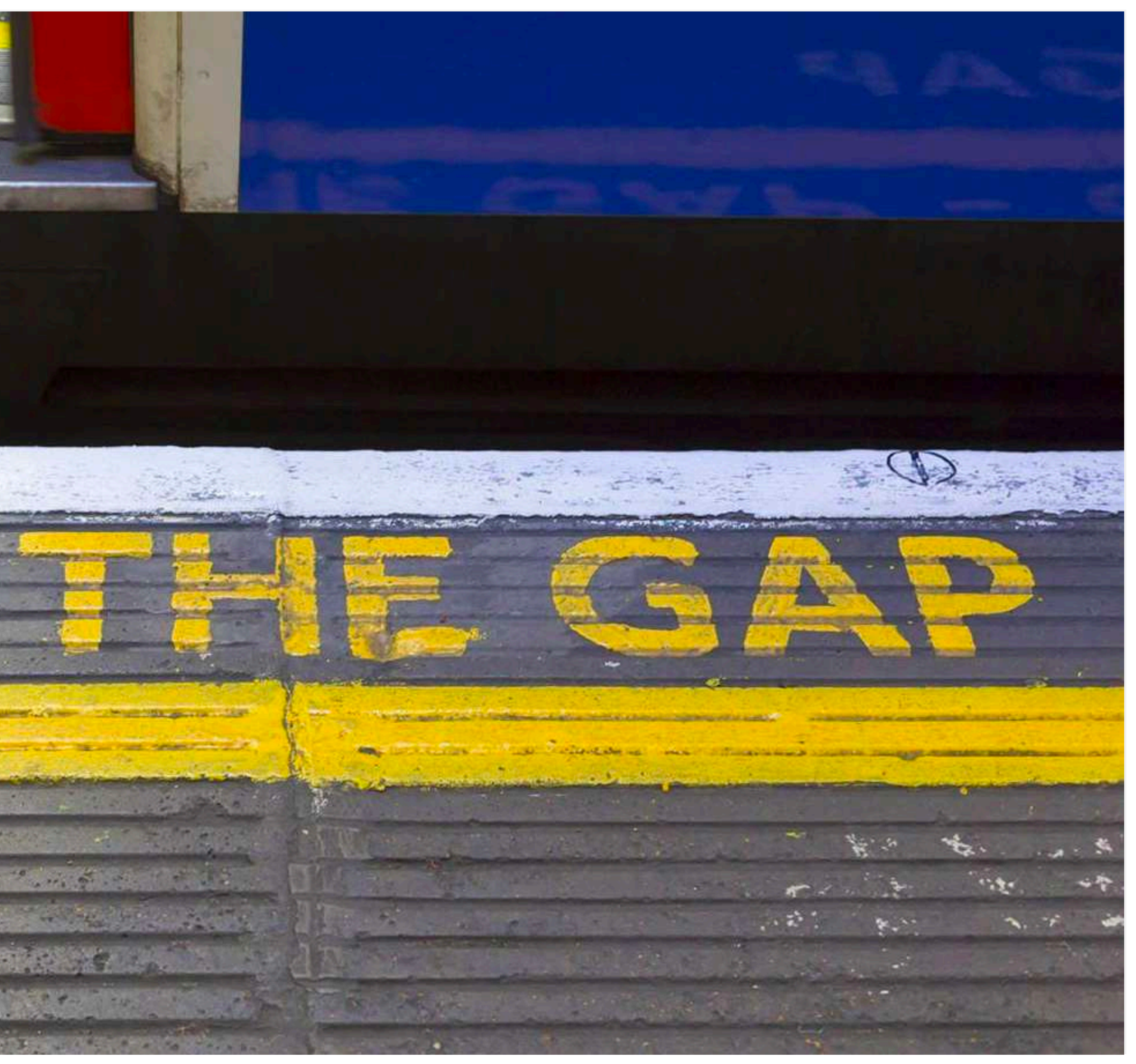


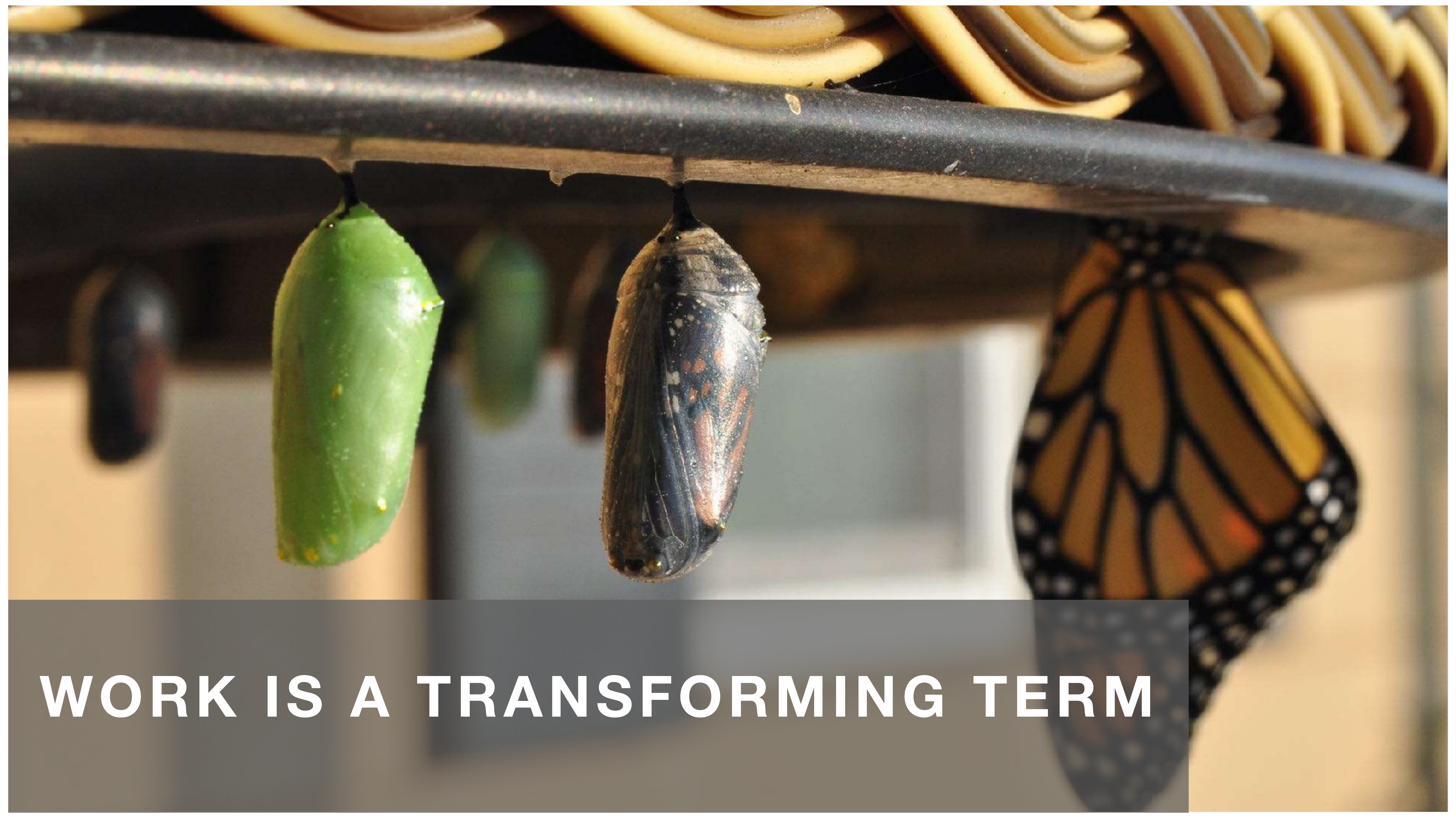
WHAT IS WORK?





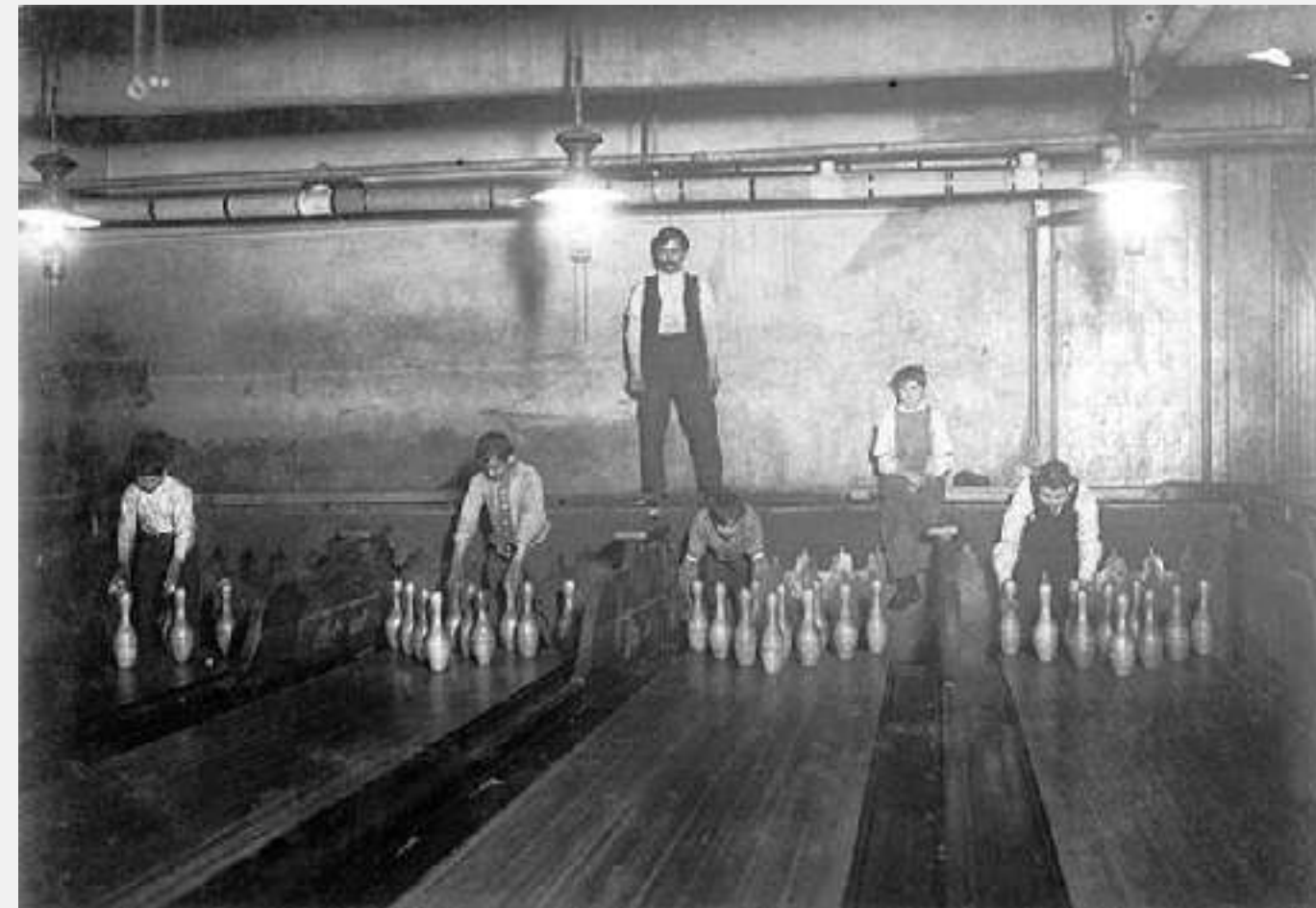
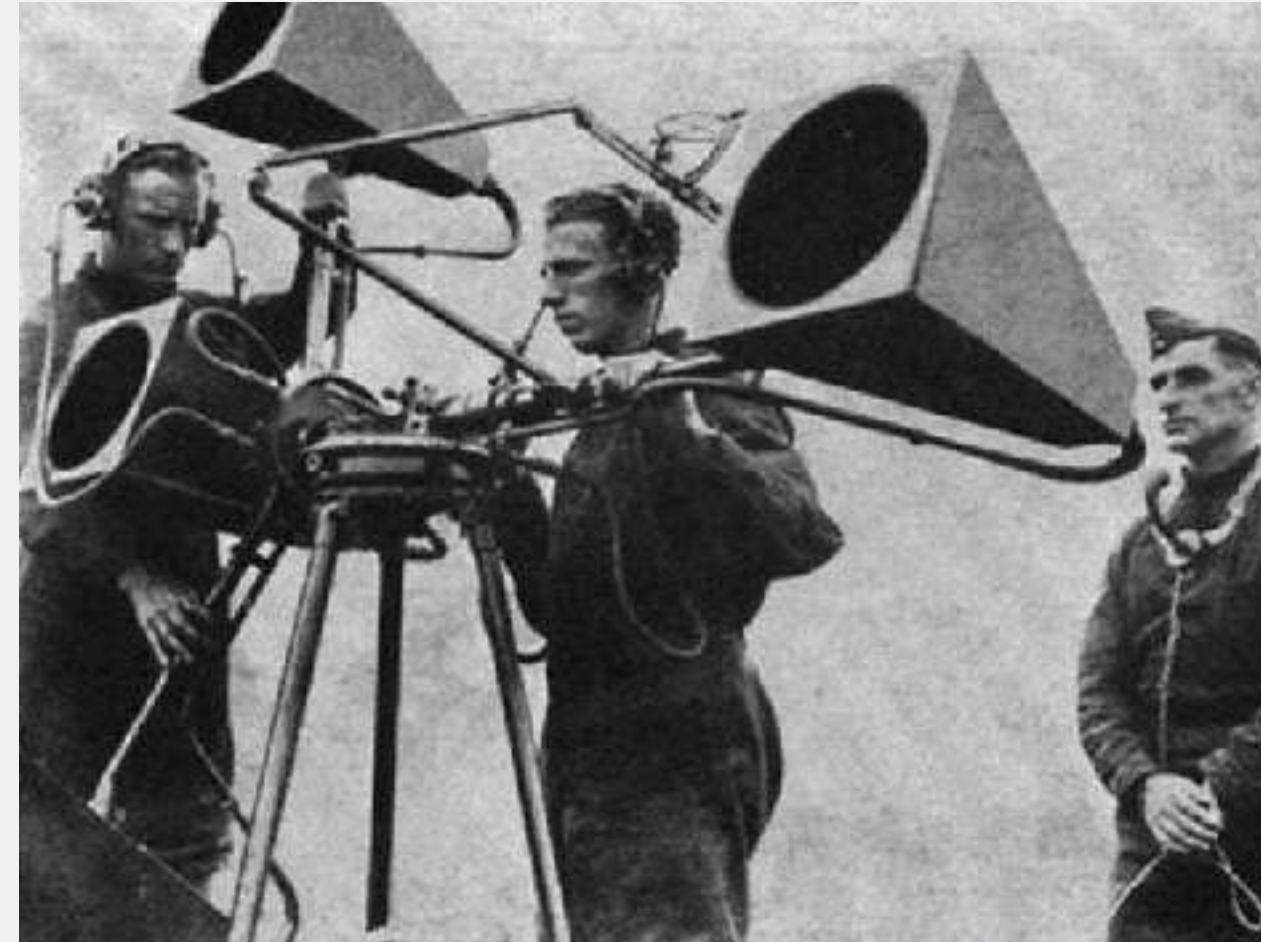
WHAT IS A SKILL?





WORK IS A TRANSFORMING TERM

Do we still know these jobs?



**85 PERCENT OF THE JOBS
IN 2030 DOESN'T EXIST YET**

Hello February 2016

JOBS THAT EXISTED 10 YEARS AGO BUT ARE GONE TODAY	JOBS THAT WERE NOT AROUND 10 YEARS AGO BUT ARE HERE TODAY	JOBS WE CAN ONLY IMAGINE BEING AROUND 10 YEARS FROM NOW
METER READER	BLOCKCHAIN ENGINEER	QUANTUM PROGRAMMER
VIDEO STORE MANAGER	YOU TUBE CONTENT CREATOR	SPACE CRAFT PILOT
DICTAPHONE OPERATOR	MOBILE APP DEVELOPER	AV DESIGNER
FILM OPERATOR	AI / DATA SCIENTIST	CULTURED MEAT FARMERS

How did we
get here?

PRIOR TO ~ 12.000 BC
**HUNTER GATHER
GROUPS**



NEOLITHIC REVOLUTION
**PERMANENT
ENCAMPMENTS**



DURING 1000 - 1700
**SMALL FARMS &
SKILLED WORK**





MECHANISATION 1760 - 1880
FARMS —> FACTORIES

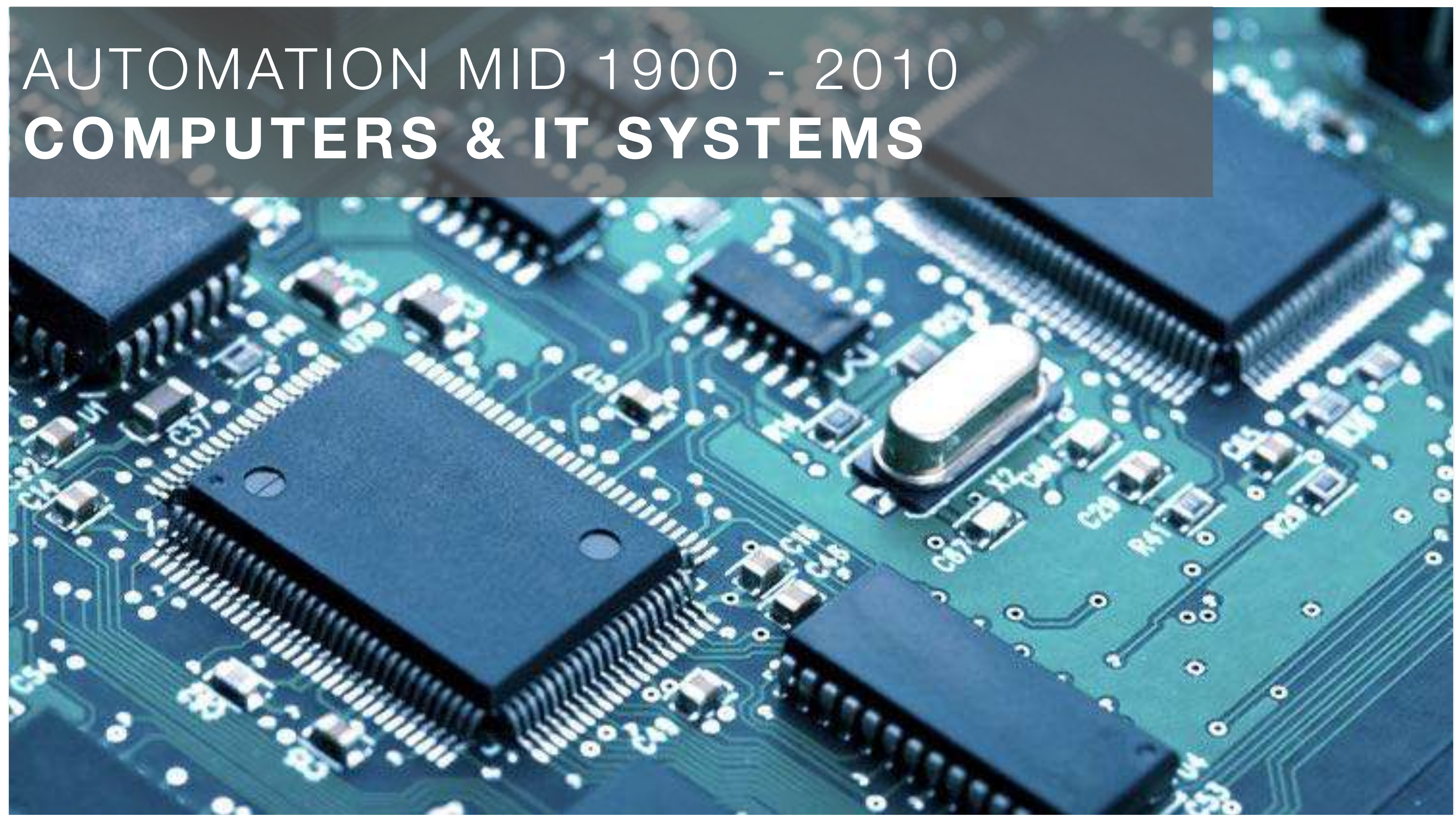
INDUSTRIALIZATION 1880 - MID 1900S

BIGGER FACTORIES | ELECTRICITY



AUTOMATION MID 1900 - 2010

COMPUTERS & IT SYSTEMS





DIGITIZATION 2010 - UNTIL NOW
NETWORKS, CYBER PHYSICAL

MECHANISATION

Changing from working largely by hand or with animals to doing that work with machinery



INDUSTRIALISATION

Development of industry on an large scale, based on the increased production of goods and services



AUTOMATION

Operating with minimal or reduced human intervention. Saving labor, energy, materials and to improve quality.



DIGITIZATION

Data, automation of brain-work, combination of data and AI opens up a fundamental different world of work.



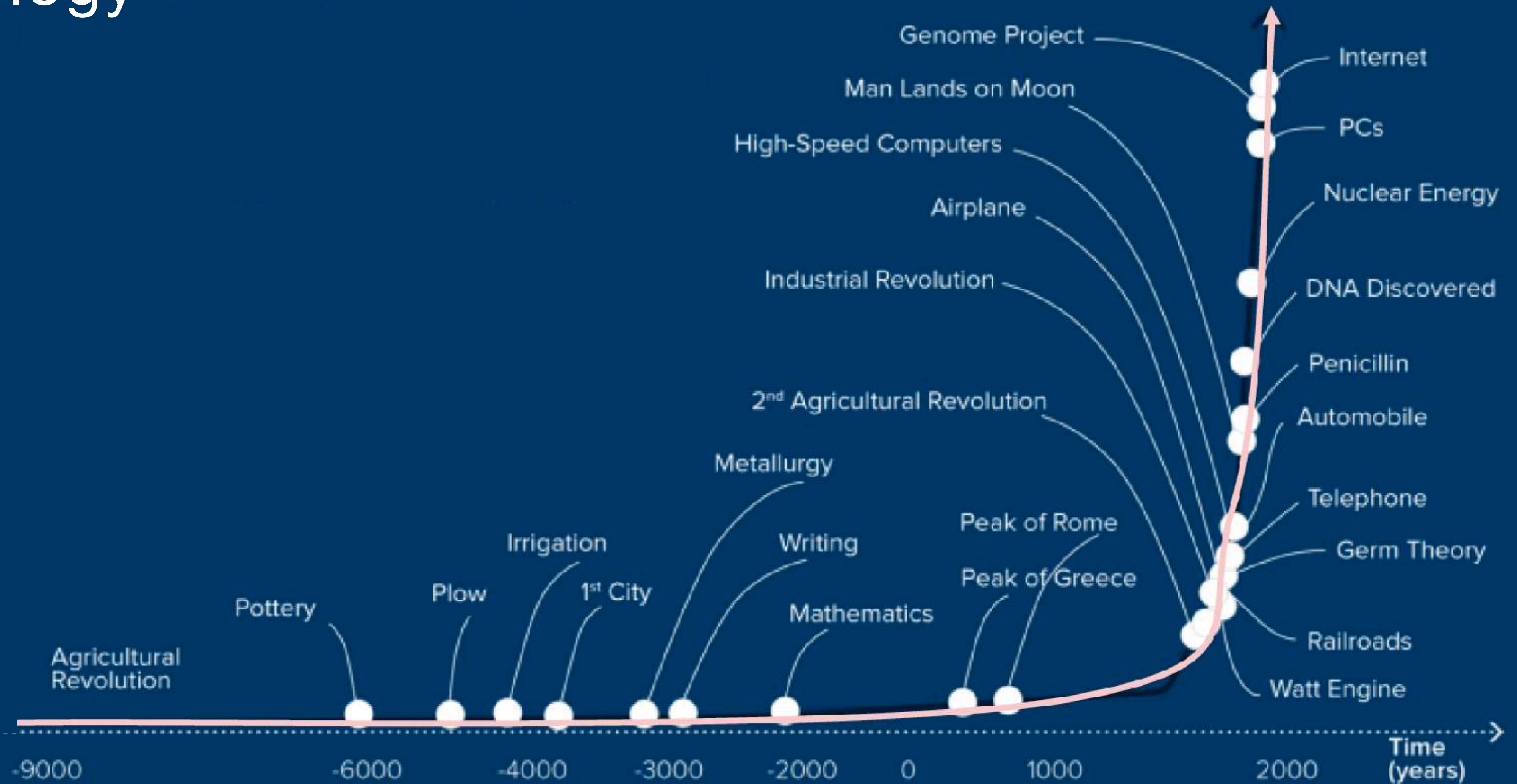
BIOTECHNOLOGY 2025-.....

TECHNOLOGY USING BIOLOGICAL SYSTEMS



Exponential

Technology



Adoption rates of technology

TIME TO REACH 50 MILLION USERS



<https://blogs.wsj.com/economics/2015/03/13/it-took-the-telephone-75-years-to-do-what-angry-birds-did-in-35-days-but-what-does-that-mean/>
<http://www.visualcapitalist.com/how-long-does-it-take-to-hit-50-million-users/>

‘Expert’ Disruption Forecasts

In the mid-1980s AT&T hired McKinsey & Co to
forecast cell phone adoption by the year 2000

THEIR (15-YEAR) PREDICTION

900,000

SUBSCRIBERS

They were **off**
by a factor of:

THE ACTUAL NUMBER WAS

1



‘Expert’ Disruption Forecasts

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THEIR (15-YEAR) PREDICTION

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SUBSCRIBERS

They were **off**
by a factor of:

120x

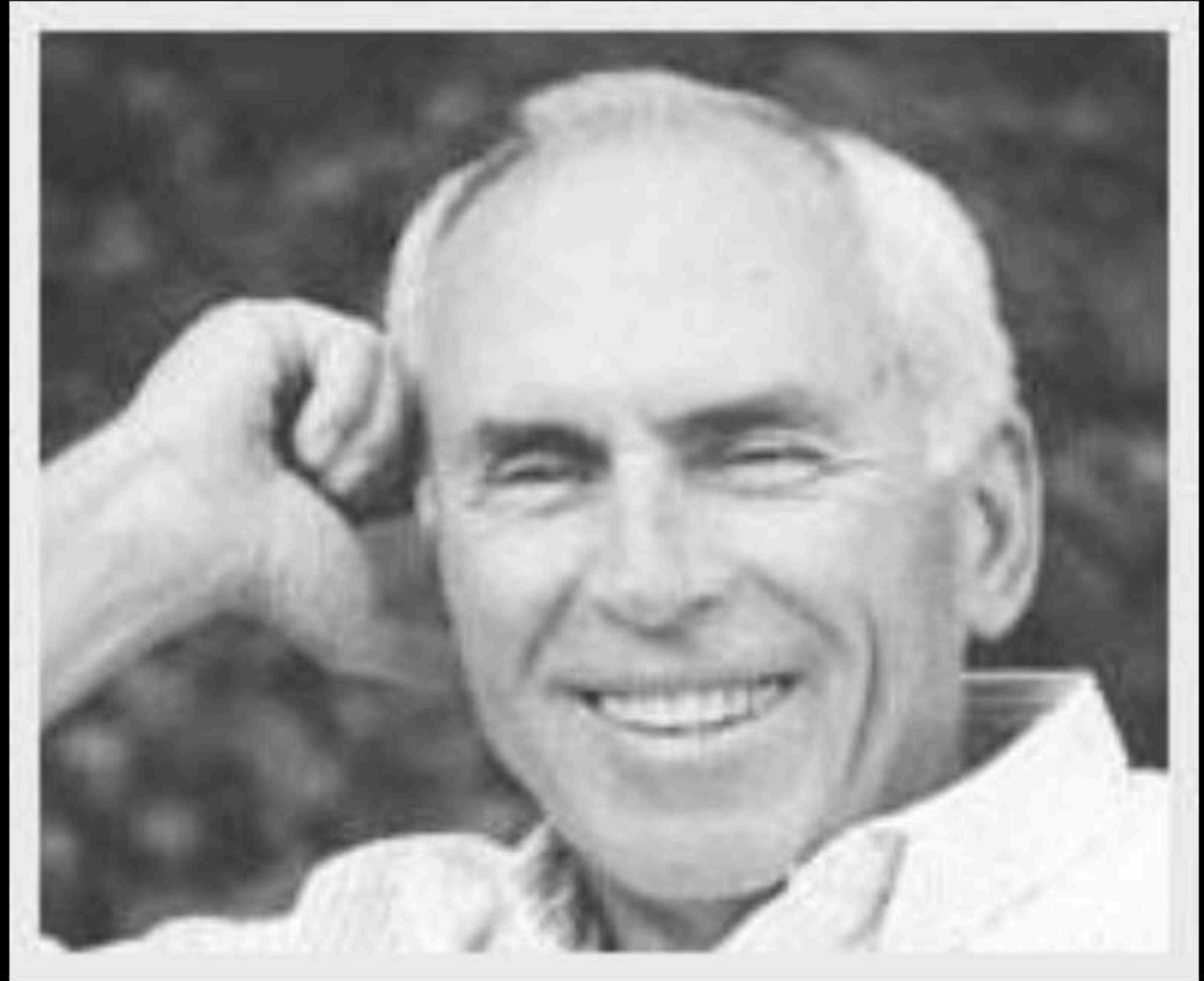
THE ACTUAL NUMBER WAS

109 million



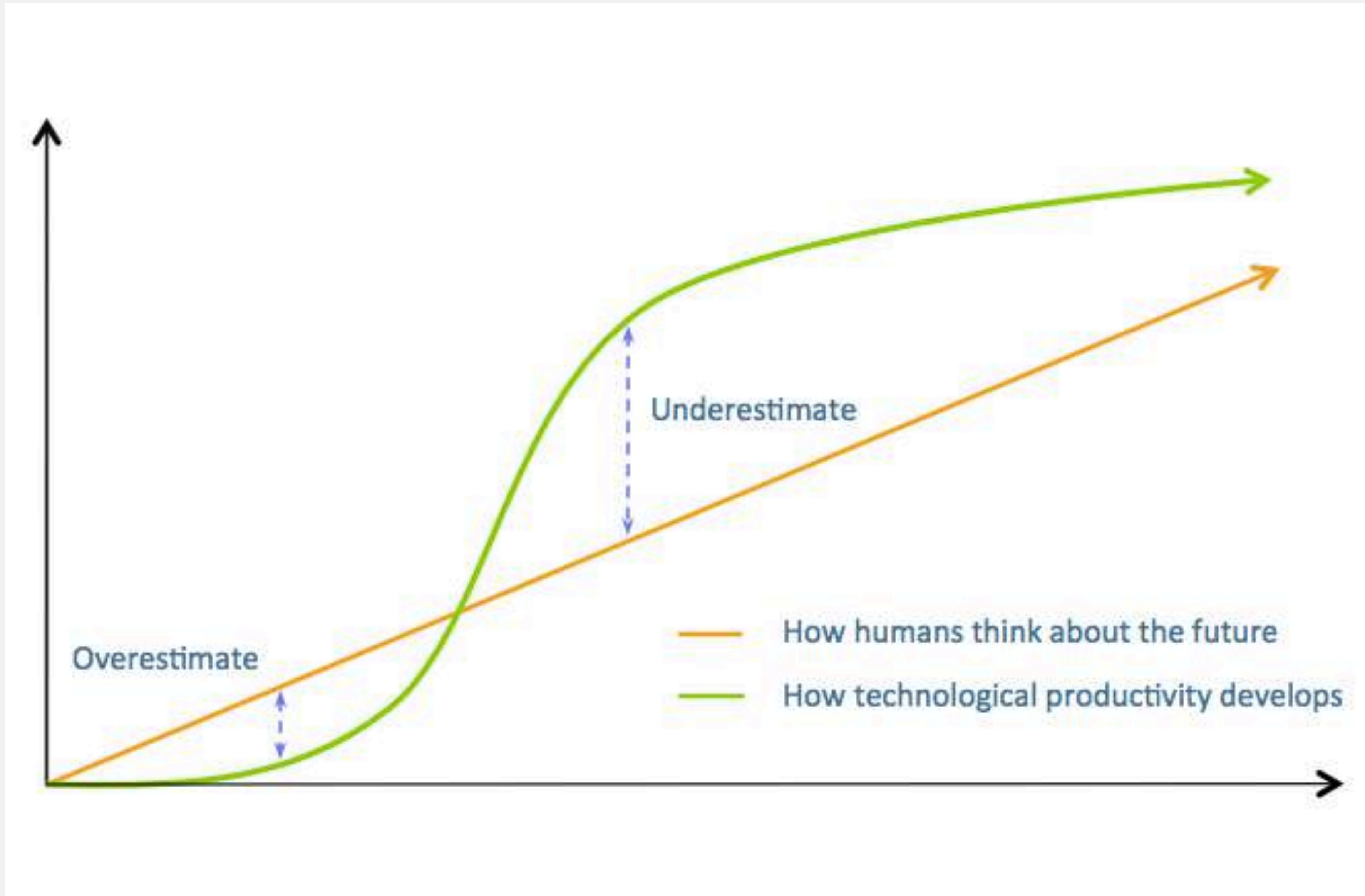
The law of Amara

“We tend to overestimate the effect of a technology in the short run and underestimate the effect in the long run.”

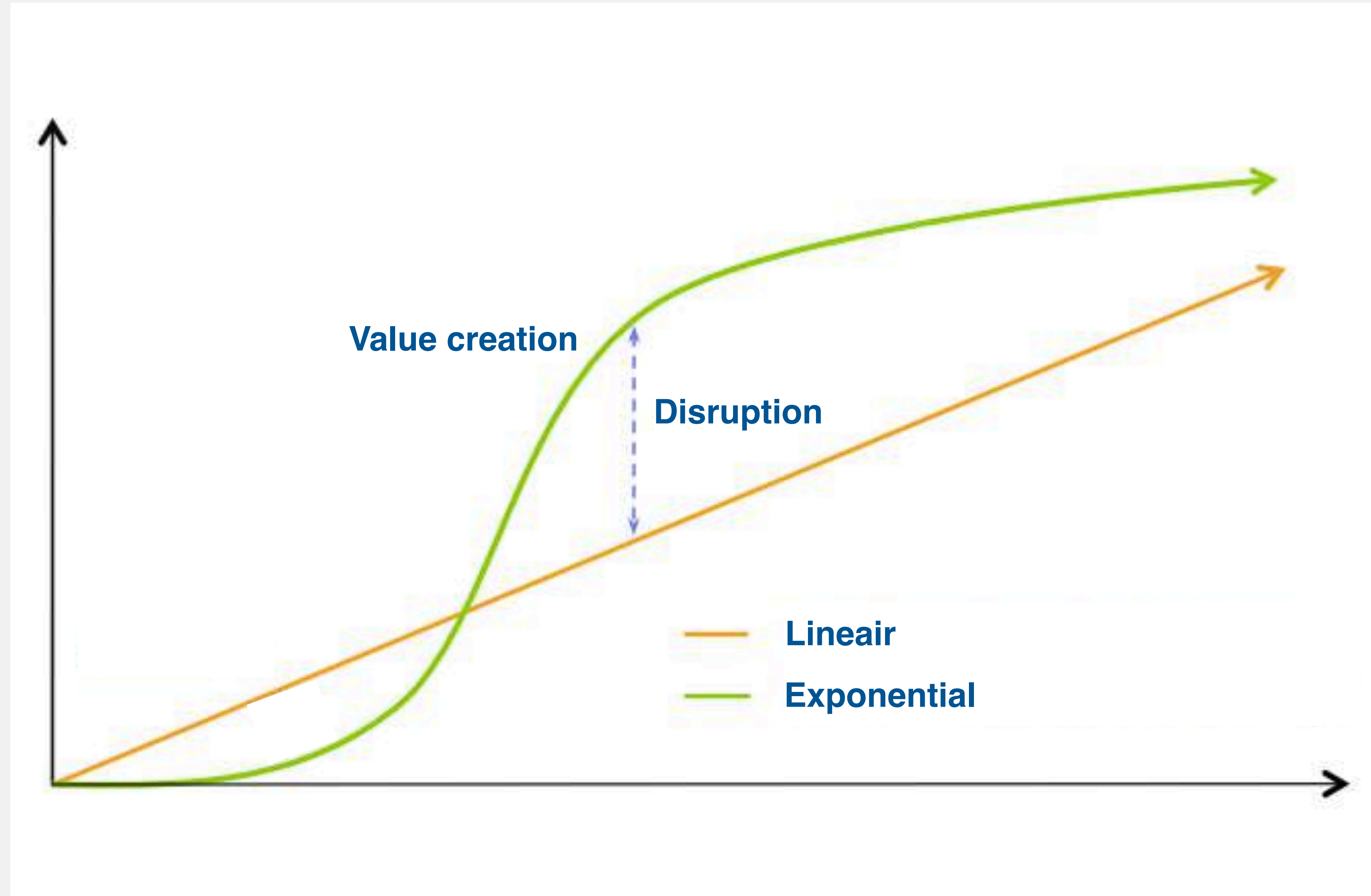


Roy Charles Amara (1925 –2007)
American researcher, scientist,
futurist and president of the
Institute for the Future

Overestimate vs underestimate



Exponential vs Linear Growth



Exponential Growth

Google bought YouTube for US\$1.65 billion in stocks just

20/04/2016

Google bought YouTube for US\$1.65 billion in stocks just 18 months after YouTube's creation.

YouTube was founded by Chad Hurley, Steve Chen, and Jawed Karim, who were all early employees of PayPal. Prior to PayPal, Hurley studied design at the Indiana University of Pennsylvania. Chen and Karim studied computer science together at the University of Illinois at Urbana-Champaign. YouTube's early headquarters were situated above a pizzeria and Japanese restaurant in San Mateo, California.



Chad Hurley
Founder



Steve Chen
Founder



25 MILLION
PER
EMPLOYEE

Exponential Growth

Facebook buys WhatsApp for \$19 billion

by Adrian Covert @CNNTech

🕒 February 19, 2014: 6:54 PM ET

👍 Recommend 62K



Social Surge - What's Trending



Starbucks' Howard Schultz: Our bathrooms are open to anyone who needs

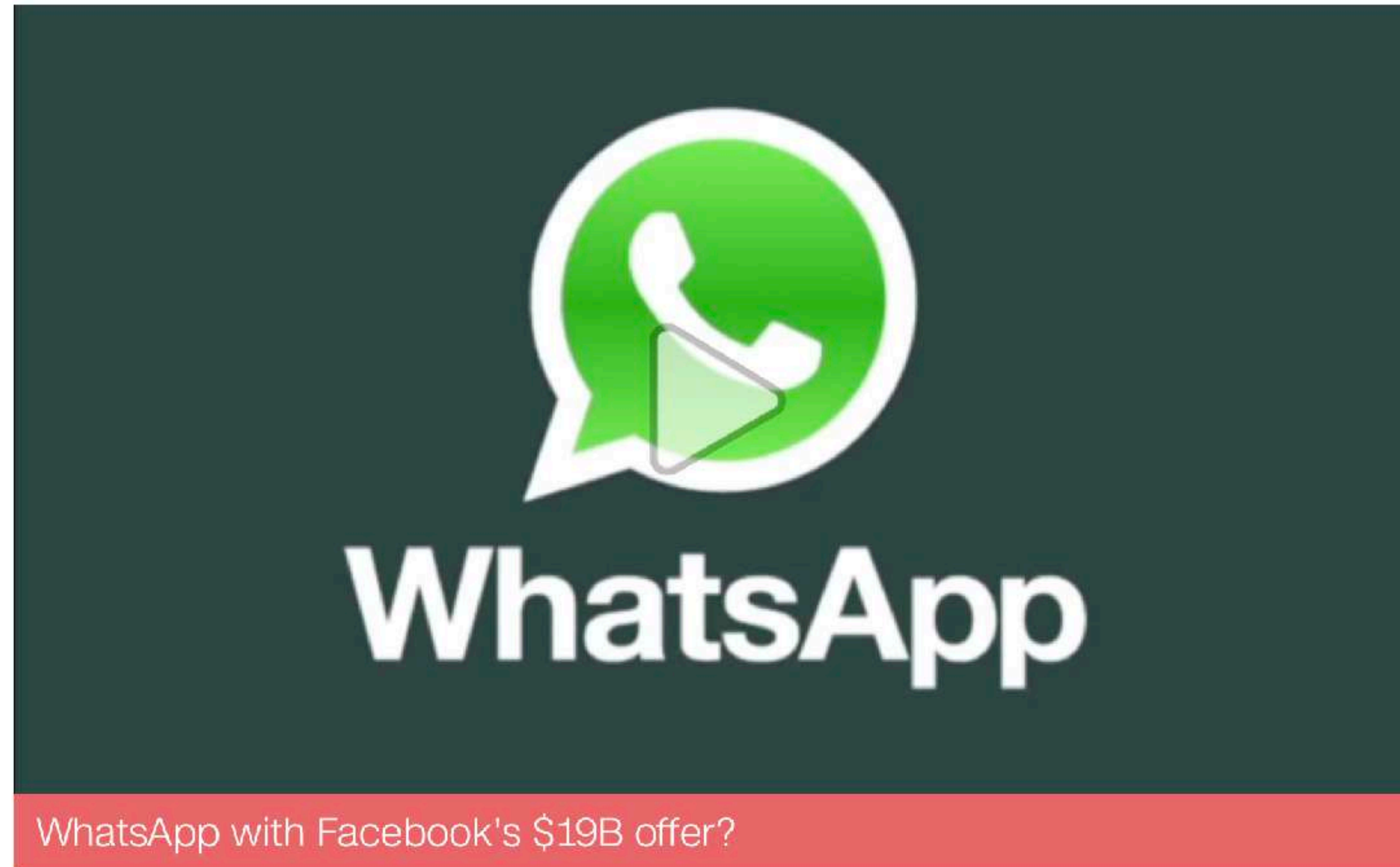
them



China is the big wild card in Trump's Iran decision



Iran fears send US oil above \$70 for first time since 2014

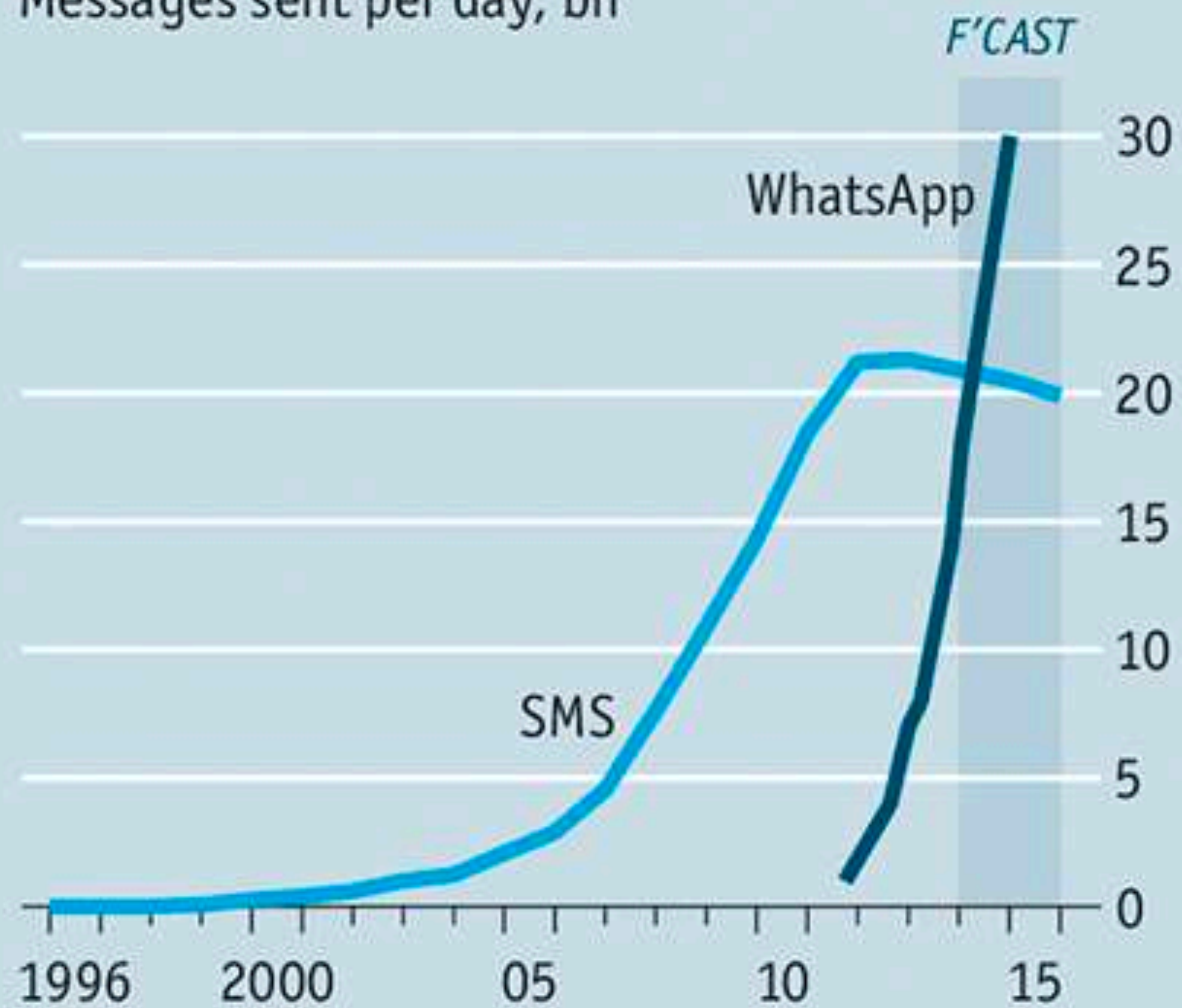




345 MILLION
PER
EMPLOYEE



Messages sent per day, bn



Sources: Portio Research; a16z

Disruption

Definition

disruption **noun**

dis·rup·tion | \ dis-'rəp-shən

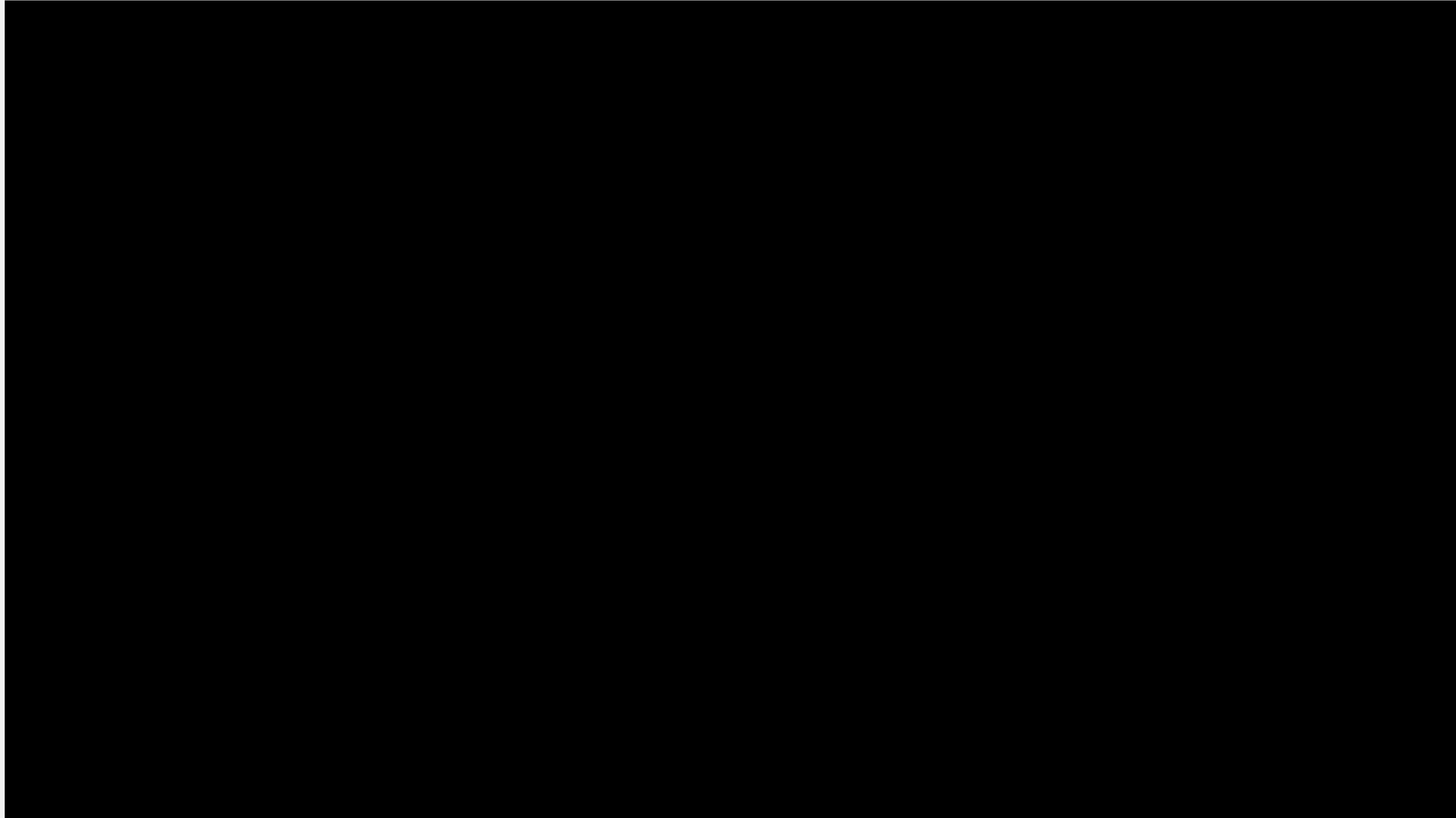
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plural **disruptions**

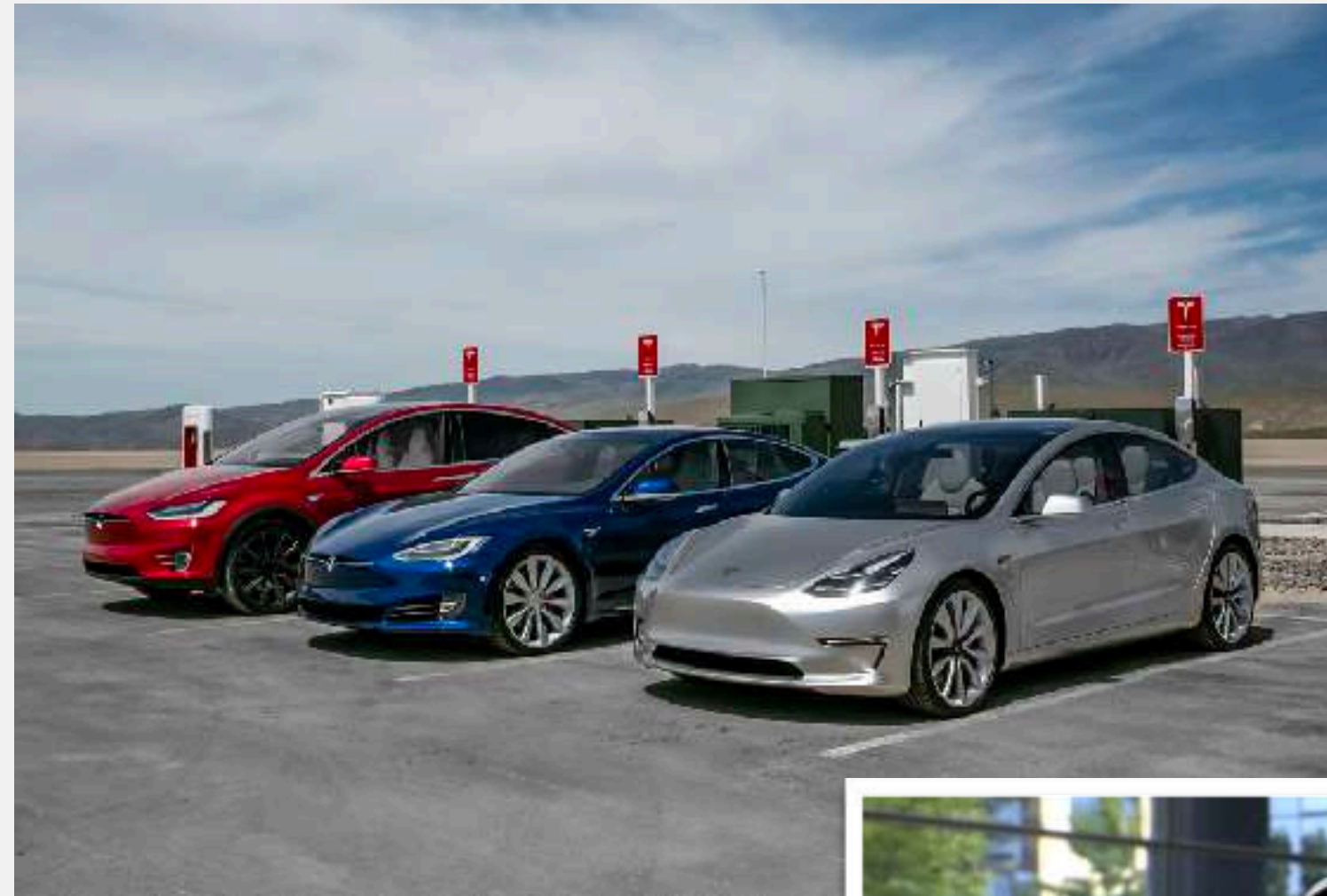
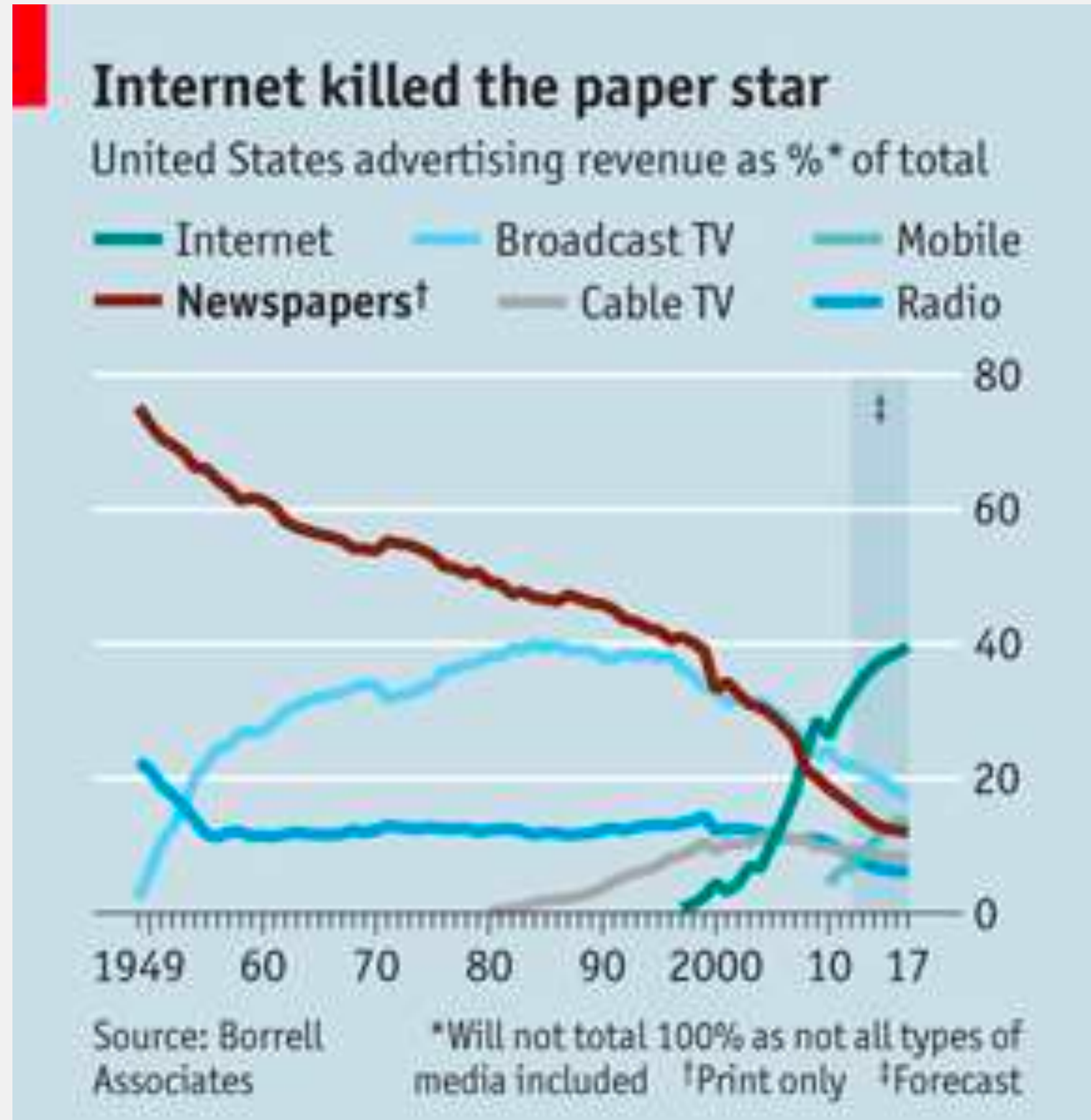
Definition of *disruption*

: the act or process of **disrupting** something :
a break or interruption in the normal course
or continuation of some activity, process,
etc.

Definition of disruption



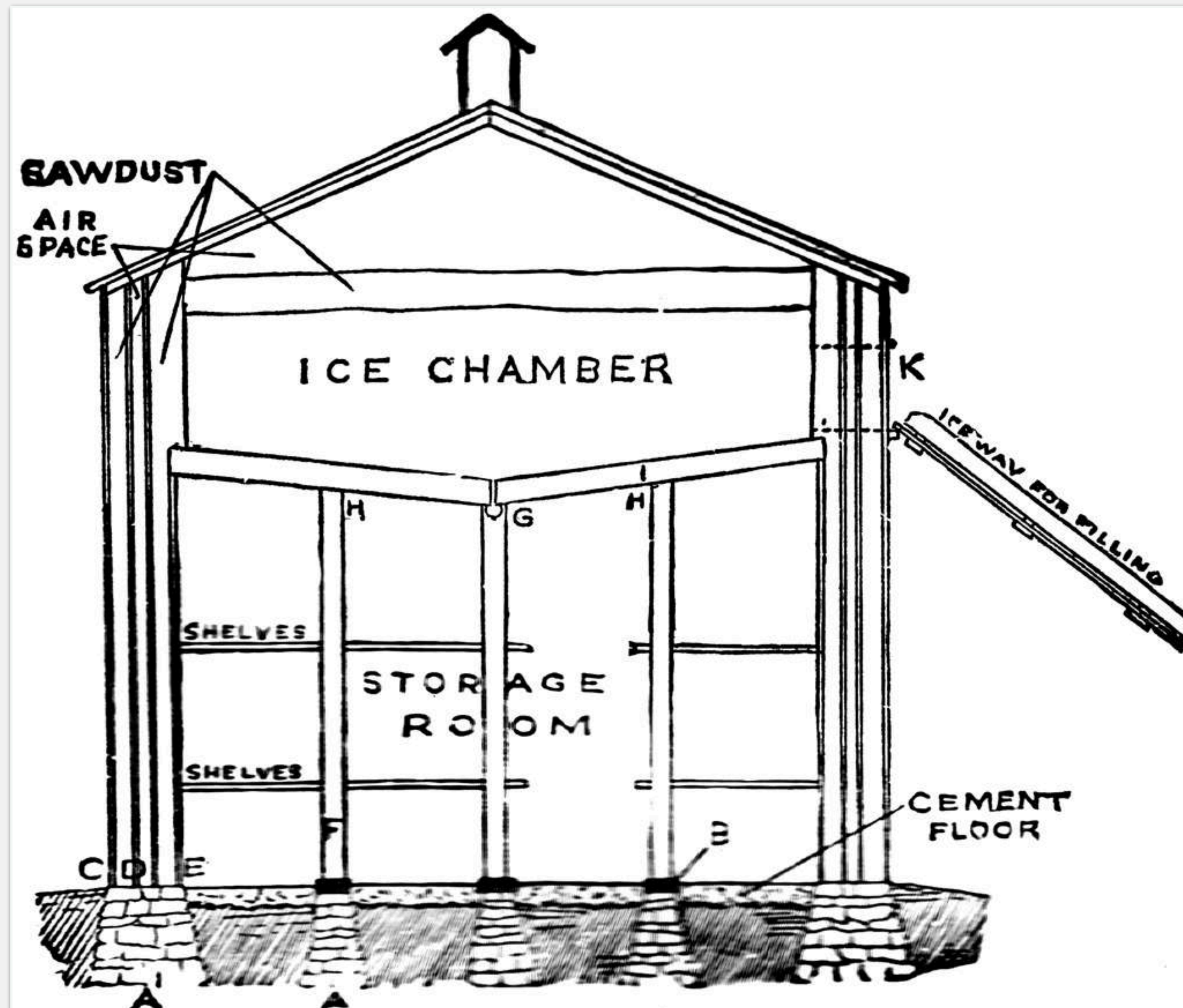
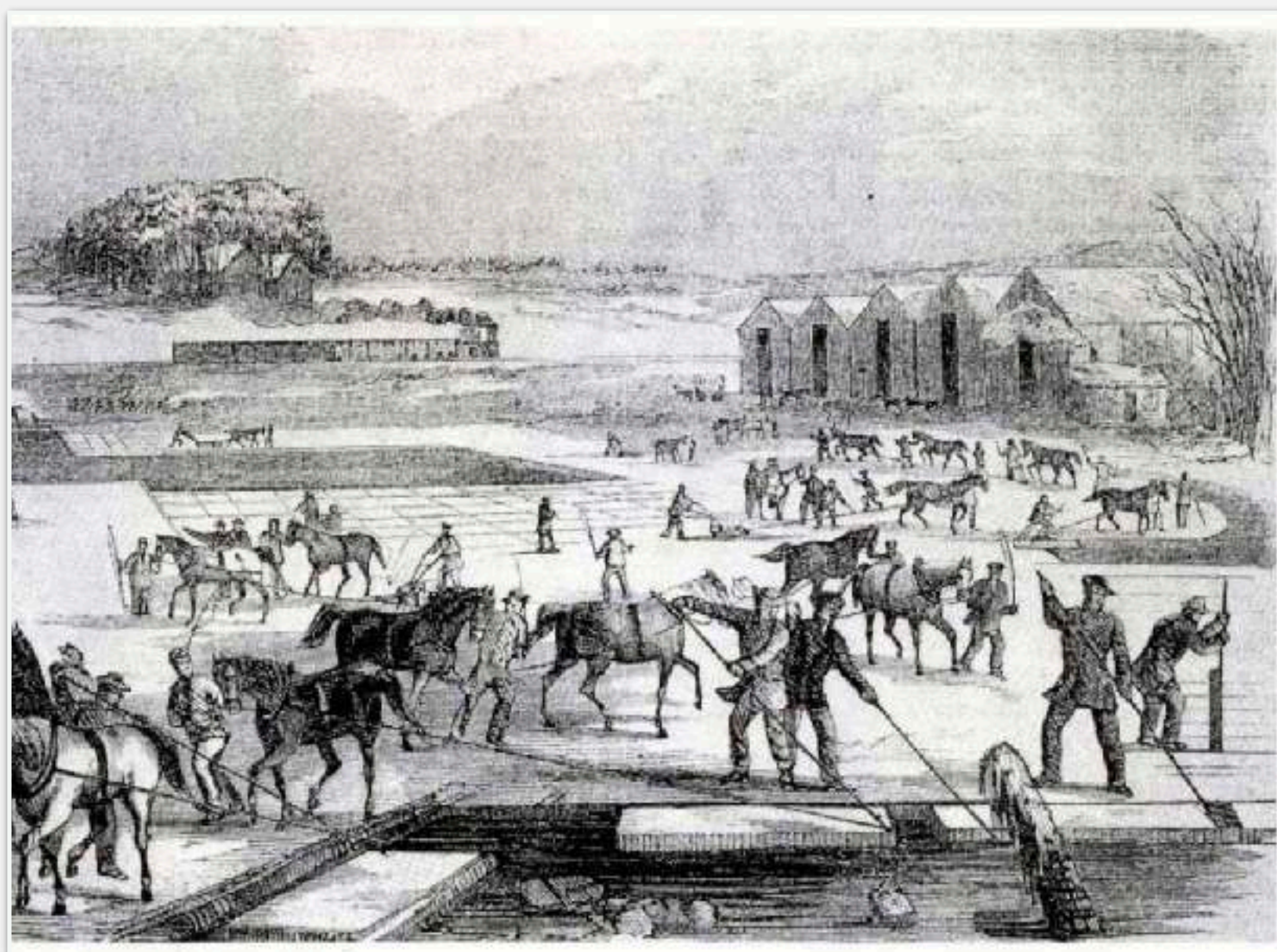
Disruption Examples



First market ever disrupted?



Frederic Tudor



History of the fridge



What will disrupt the fridge?



Long life
products



Gene
editing?



Amazon
Fresh?

What will disrupt the fridge?



Exponential Technologies

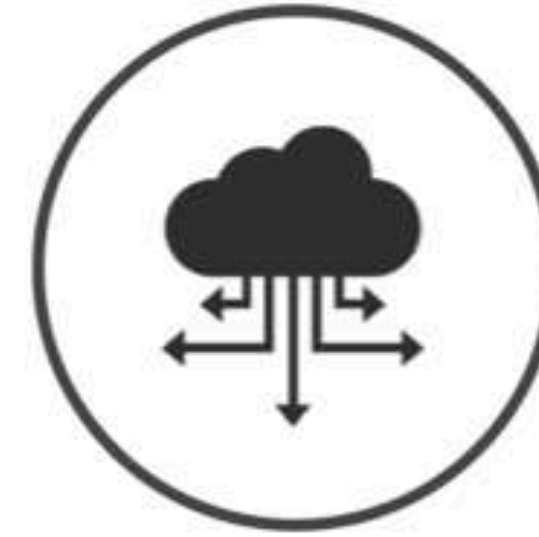
Eight technologies are transforming the industries



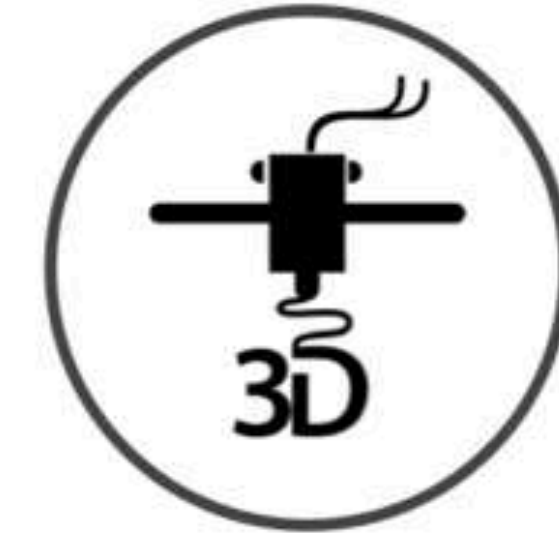
Artificial intelligence



Autonomous vehicles



Big data analytics and cloud



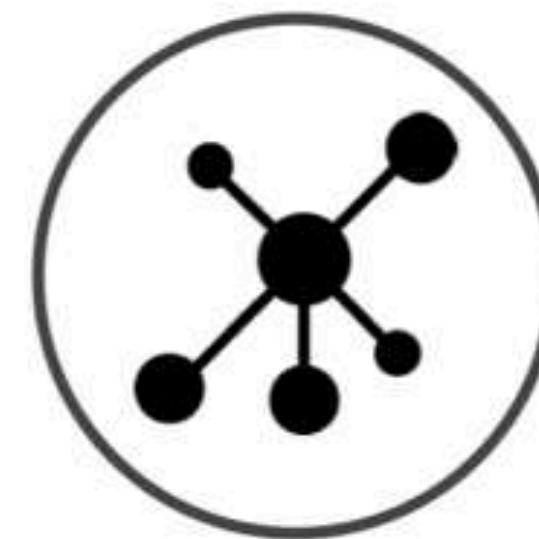
Custom manufacturing and 3D printing



Internet of Things (IoT) and connected devices



Robots and drones



Social media and platforms



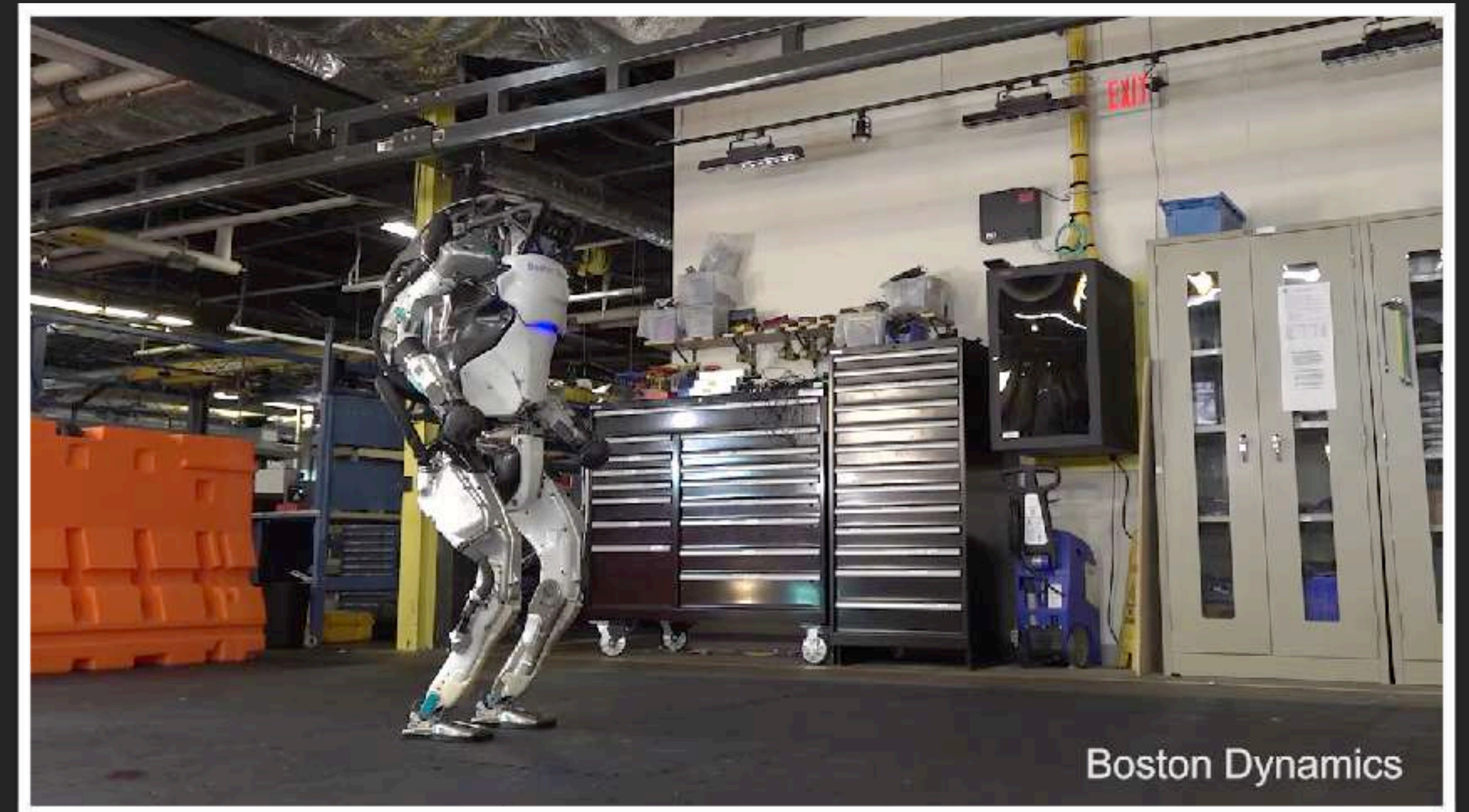
AR / VR



Robots & Drones



2017



2019



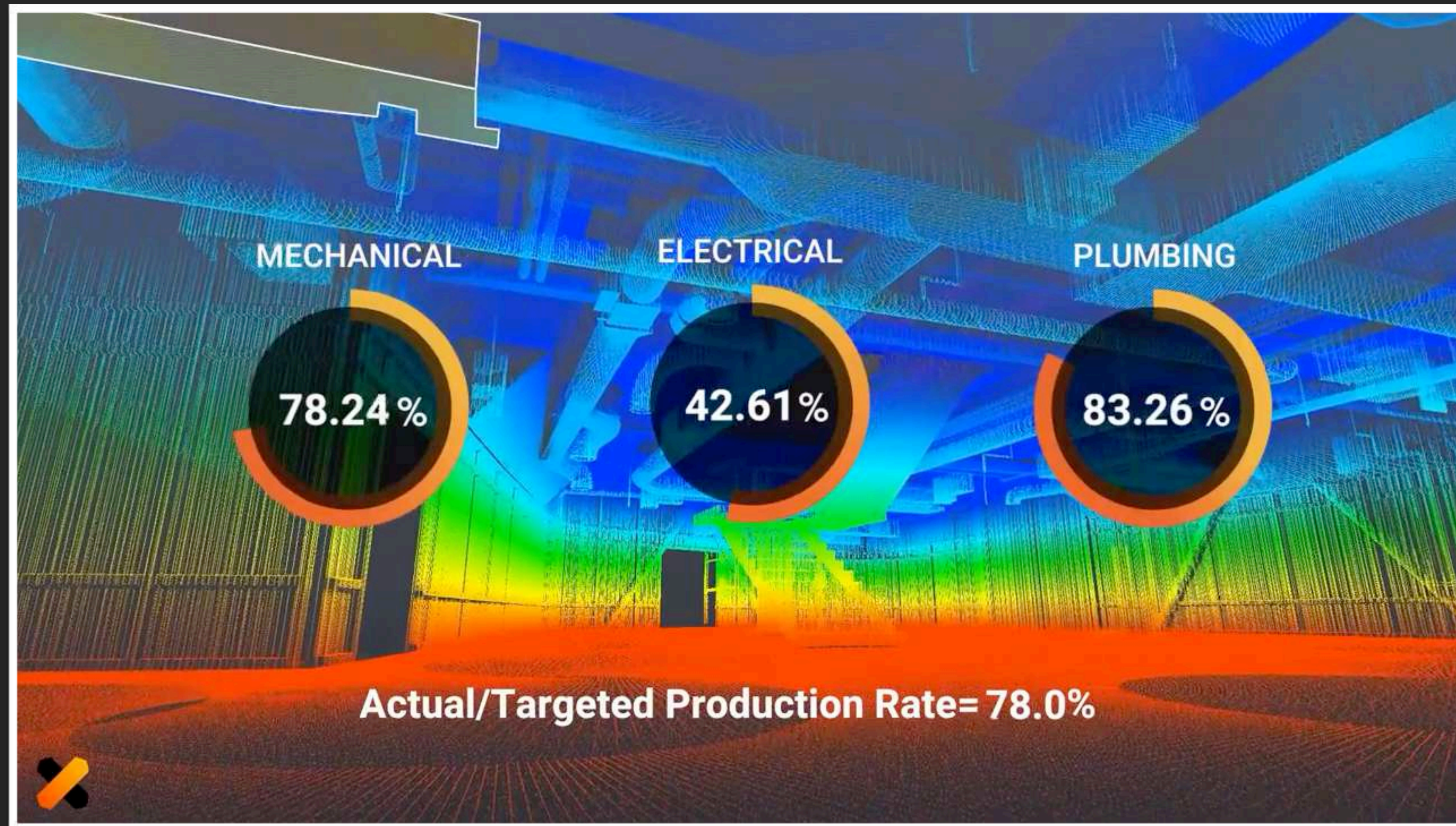
Robots & Drones



Augmented strength: Exoskeletons



Robots & Drones





Autonomy

Cloud Computing

+

Machine Learning / AI

+

Image recognition

+

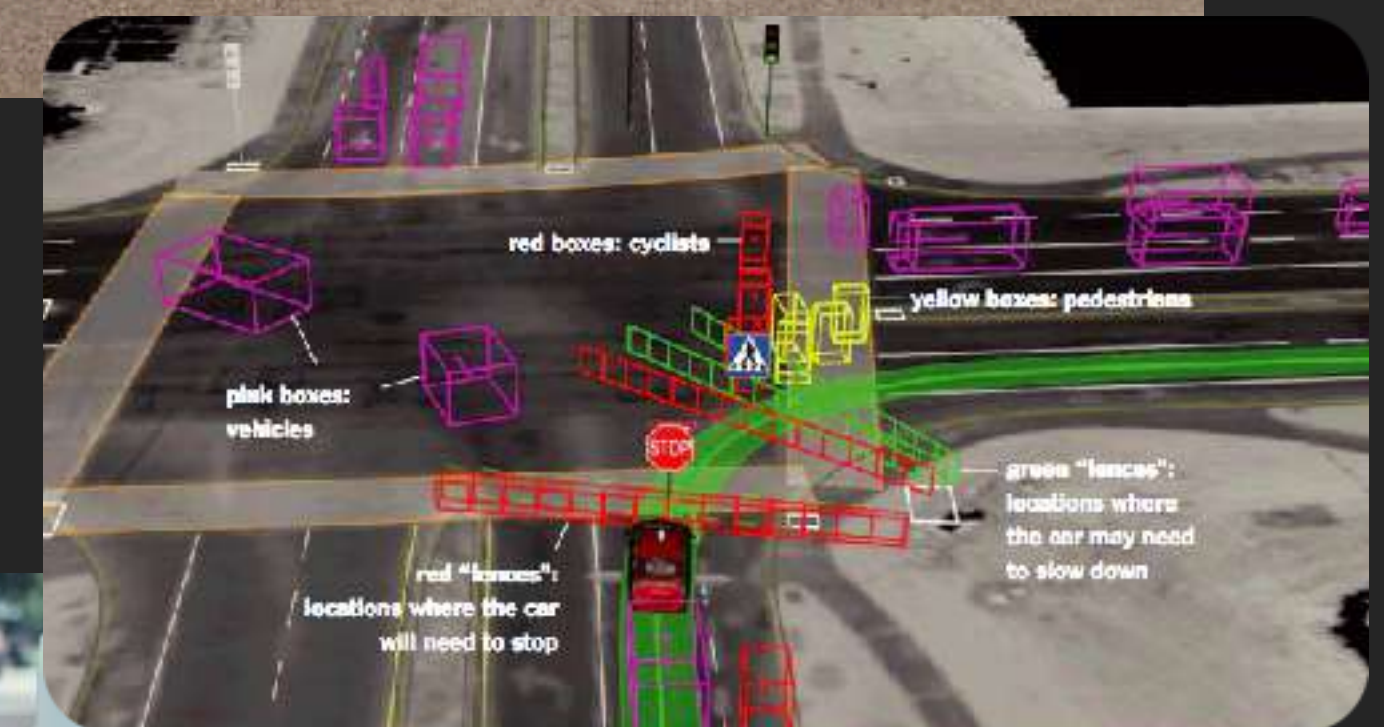
Computer Networks

+

5G



‘Everything that moves will go autonomous’



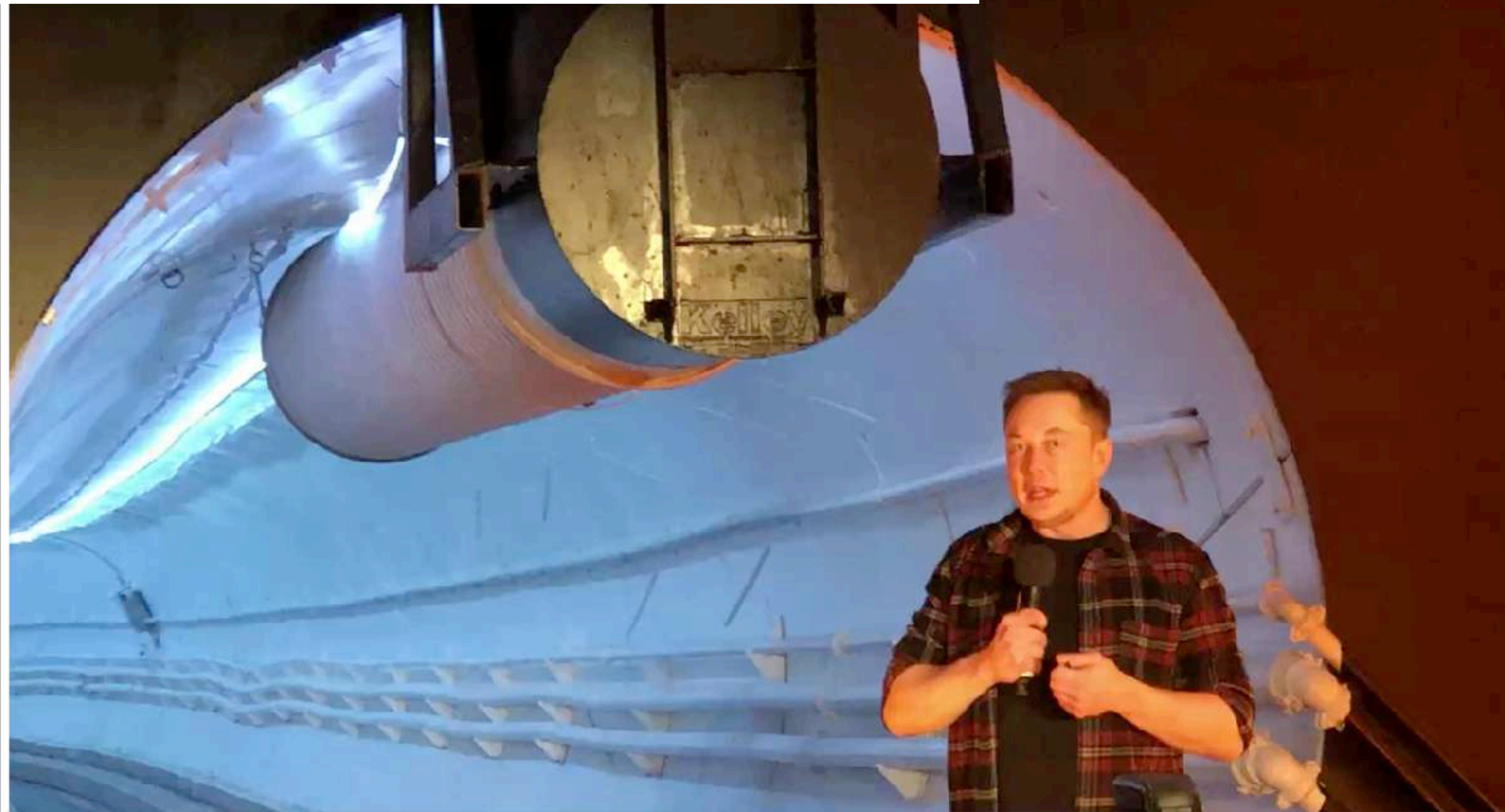


Autonomy

TECH TRANSPORTATION BORING COMPANY

Las Vegas approves a \$48.6 million contract with Elon Musk's Boring Company

By Elizabeth Lcpatto | @mslcpatto | May 22, 2019, 6:13pm EDT



'Transportation has to go 3D'



Elon Musk
@elonmusk

Boring Company starts digging Vegas tunnel in 2 months. Aiming to finish by end of year.

The Boring Company @boringcompany

Thank you to @LVCVA @LVCVAImpact – hope we can do great things for Las Vegas together! theverge.com/2019/3/6/18252...

31.7K 3:36 AM - May 23, 2019

3,584 people are talking about this





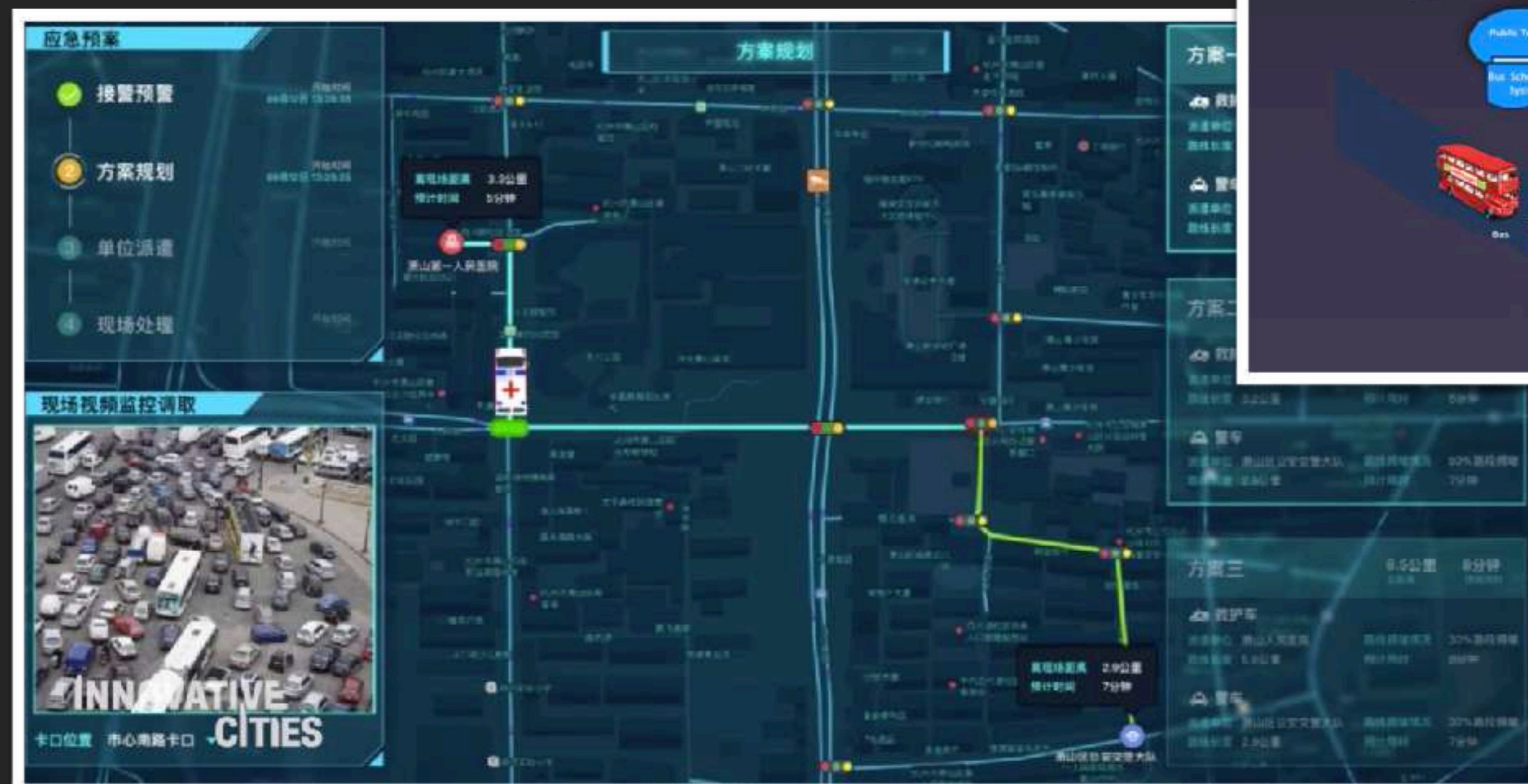
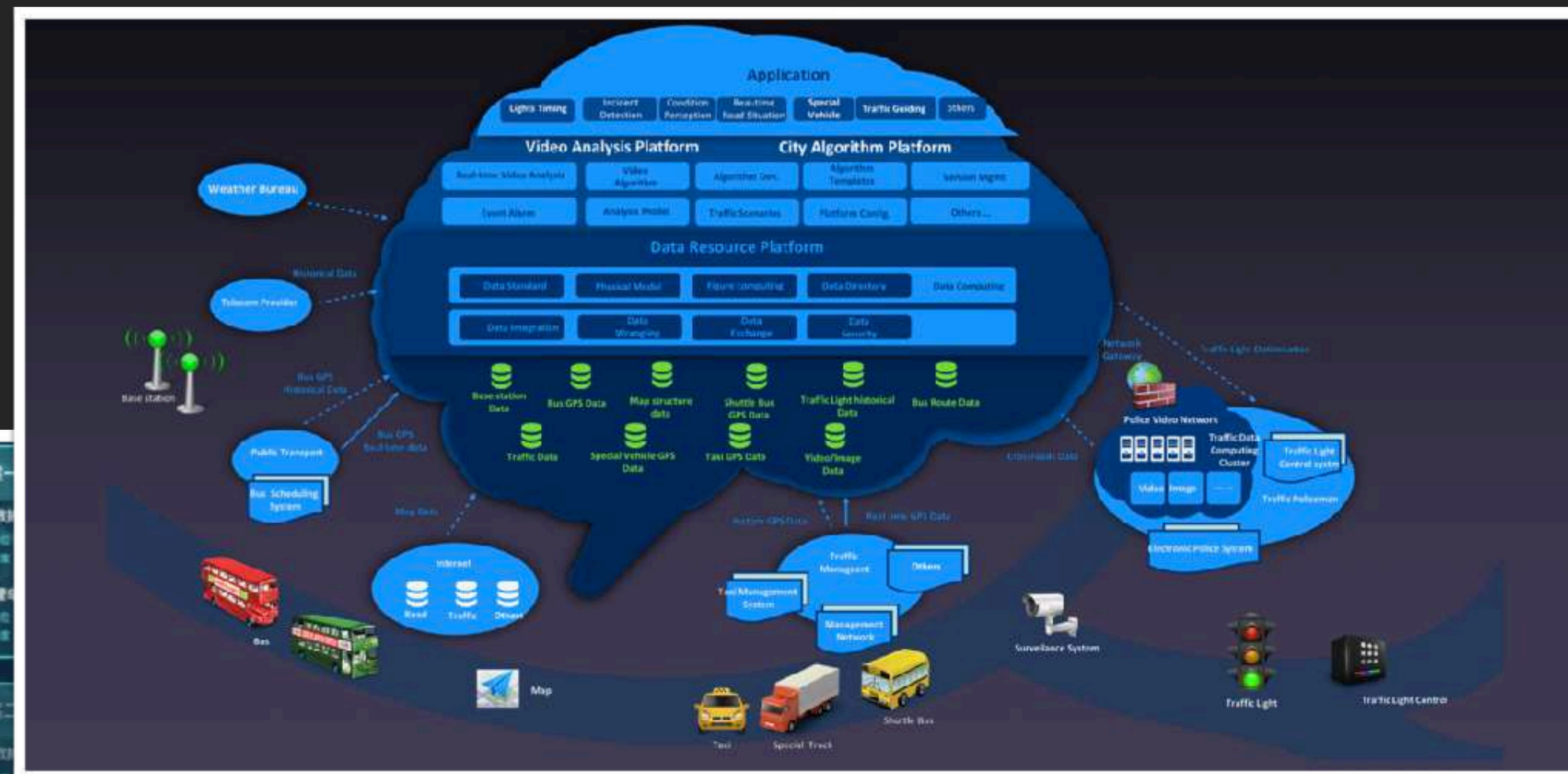
Internet of Things



Woven City: Toyota



Internet of Things



Alibaba City Brain



3D Printing



March 2019



3D Printing

Construction Completed on Largest 3D-Printed Building in the World



January 2020

Interfaces: Images and sharing

40K Years Ago =

Oldest Known Image...
Painting, Indonesia



5K Years Ago =

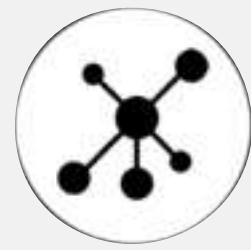
Oldest Known Text...
Cuneiform, Mesopotamia



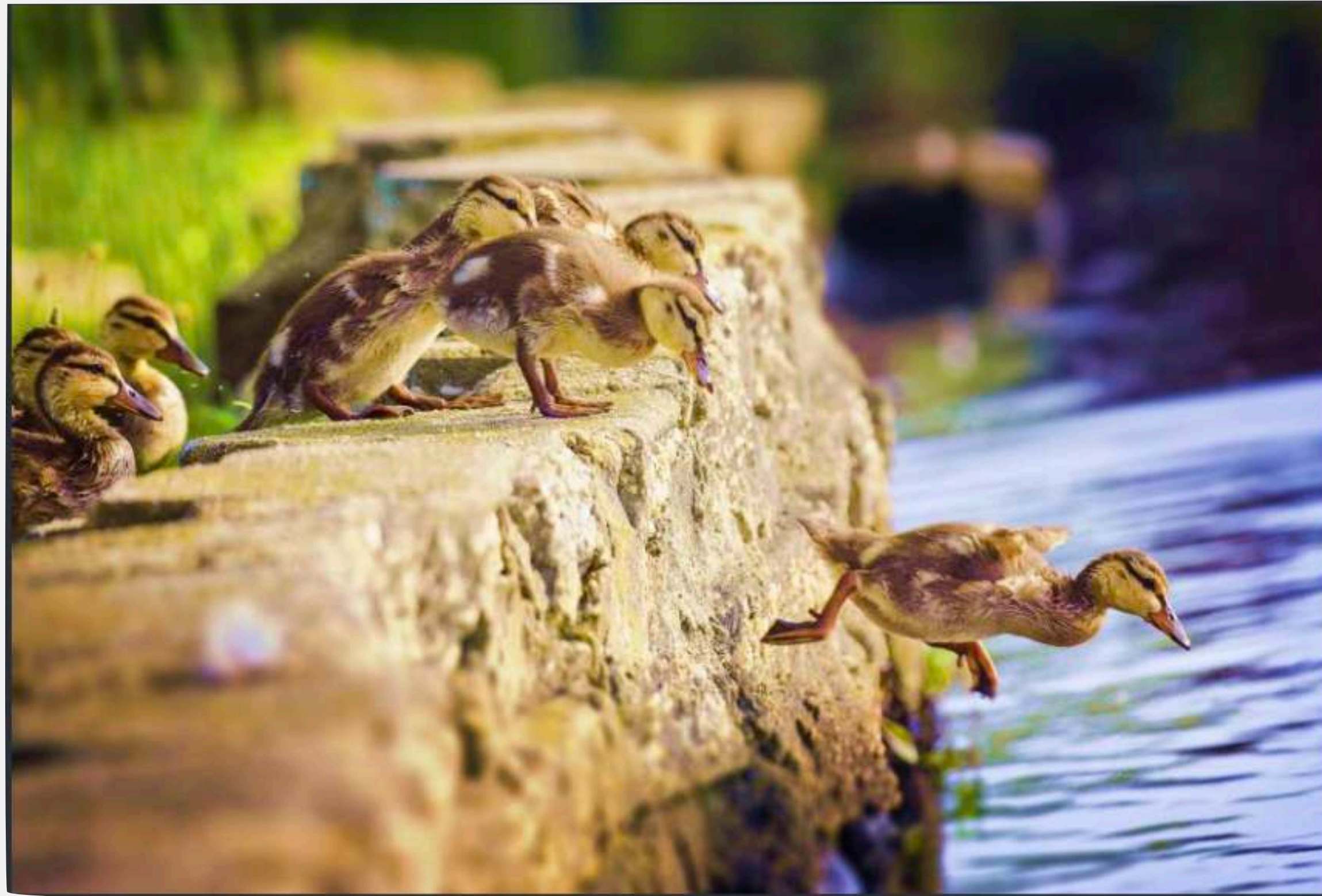
131 Years Ago =

Oldest Known Moving Image...
Video, United Kingdom





A picture or a 1000 words?



Mallard Duckling making a running leap into the water from the rock ledge at Argyle Lake, Babylon, Long Island. Mallard ducks are the most common & recognizable wild ducks in the Northern Hemisphere. They spend most of their time near natural bodies of water (ponds, marshes, streams, & lakes) where they feed on plants, invertebrates, fish, and insects. Mallards are dabbling, or surface-feeding, ducks because they eat by tipping underwater for food—head down, feet and tail in the air—rather than diving. Mallards also forage and graze for food on land. The male mallard duck, called a drake, sports a glossy green head, a white ring around its neck and a rich, chestnut-brown breast. The mallard duck's outer feathers are waterproof, because of an oil that's secreted from a gland near the tail. Soon after birth, baby ducks, called ducklings, open their eyes. A little more than a day after hatching, ducklings can run, swim, and forage for food on their own. They stay in the nest for less than a month. A group of ducklings is called a brood. Outside the nest, the brood sticks close by the mother for safety, often following behind her in a neat, single-file line. Mallard Duckling making a running leap into the water from the rock ledge at Argyle Lake, Babylon, Long Island. Mallard ducks are the most common & recognizable wild ducks in the Northern Hemisphere. They spend most of their time near natural bodies of water (ponds, marshes, streams, & lakes) where they feed on plants, invertebrates, fish, and insects. Mallards are dabbling, or surface-feeding, ducks because they eat by tipping underwater for food—head down, feet and tail in the air—rather than diving. Mallards also forage and graze for food on land. The male mallard duck, called a drake, sports a glossy green head, a white ring around its neck and a rich, chestnut-brown breast. The mallard duck's outer feathers are waterproof, because of an oil that's secreted from a gland near the tail. Soon after birth, baby ducks, called ducklings, open their eyes. A little more than a day after hatching, ducklings can run, swim, and forage for food on their own. They stay in the nest for less than a month. A group of ducklings is called a brood. Outside the nest, the brood sticks close by the mother for safety, often following behind her in a neat, single-file line. Mallard Duckling making a running leap into the water from the rock ledge at Argyle Lake, Babylon, Long Island. Mallard ducks are the most common & recognizable wild ducks in the Northern Hemisphere. They spend most of their time near natural bodies of water (ponds, marshes, streams, & lakes) where they feed on plants, invertebrates, fish, and insects. Mallards are dabbling, or surface-feeding, ducks because they eat by tipping underwater for food—head down, feet and tail in the air—rather than diving. Mallards also forage and graze for food on land. The male mallard duck, called a drake, sports a glossy green head, a white ring around its neck and a rich, chestnut-brown breast. The mallard duck's outer feathers are waterproof, because of an oil that's secreted from a gland near the tail. Soon after birth, baby ducks, called ducklings, open their eyes. A little more than a day after hatching, ducklings can run, swim, and forage for food on their own. They stay in the nest for less than a month. A group of ducklings is called a brood. Outside the nest, the brood sticks close

'Writing was a hack, a detour'

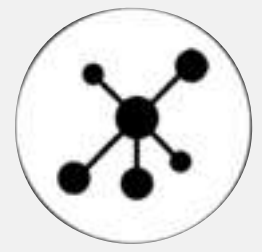
Kevin Systrom - IG Co Founder





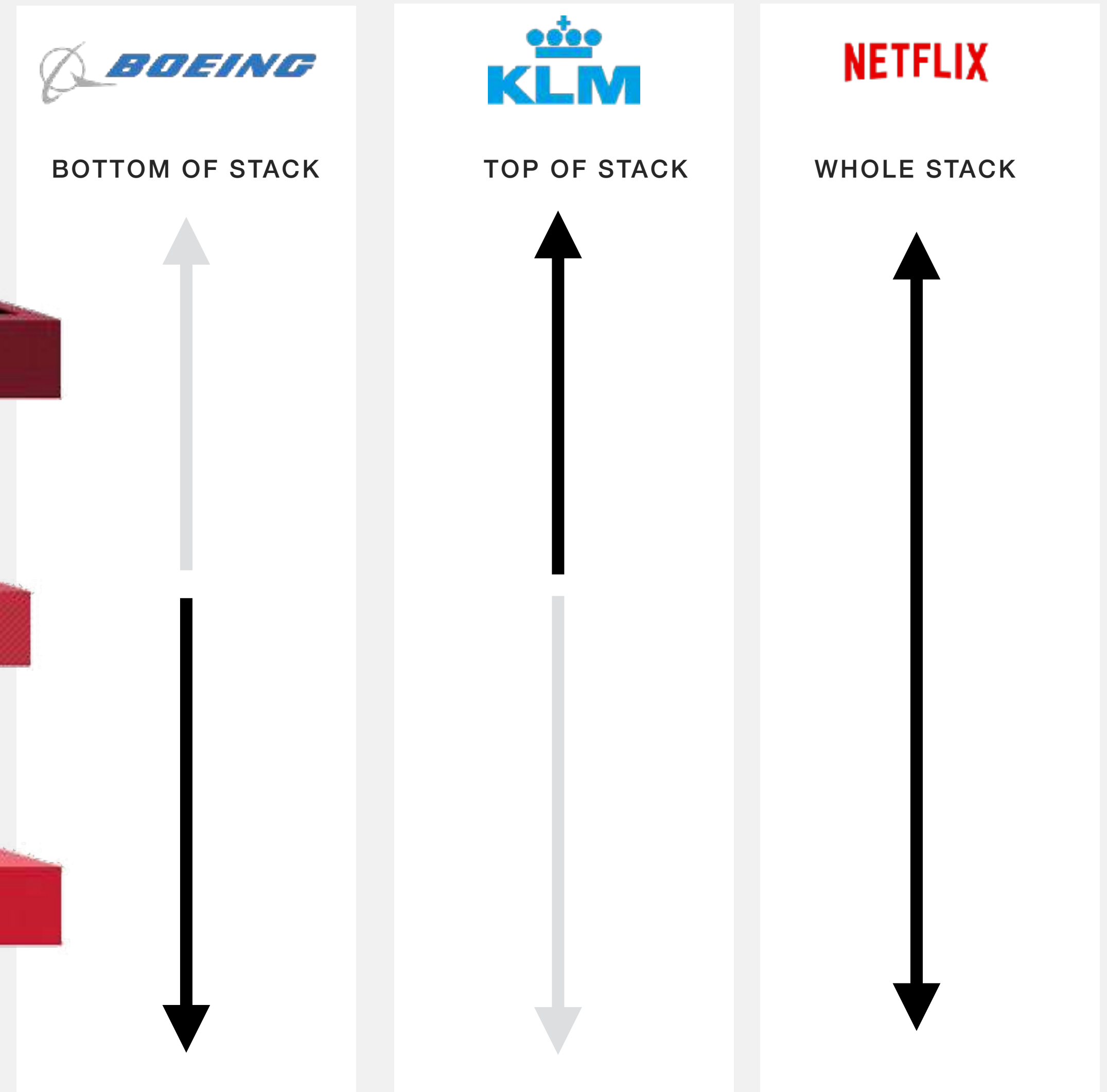
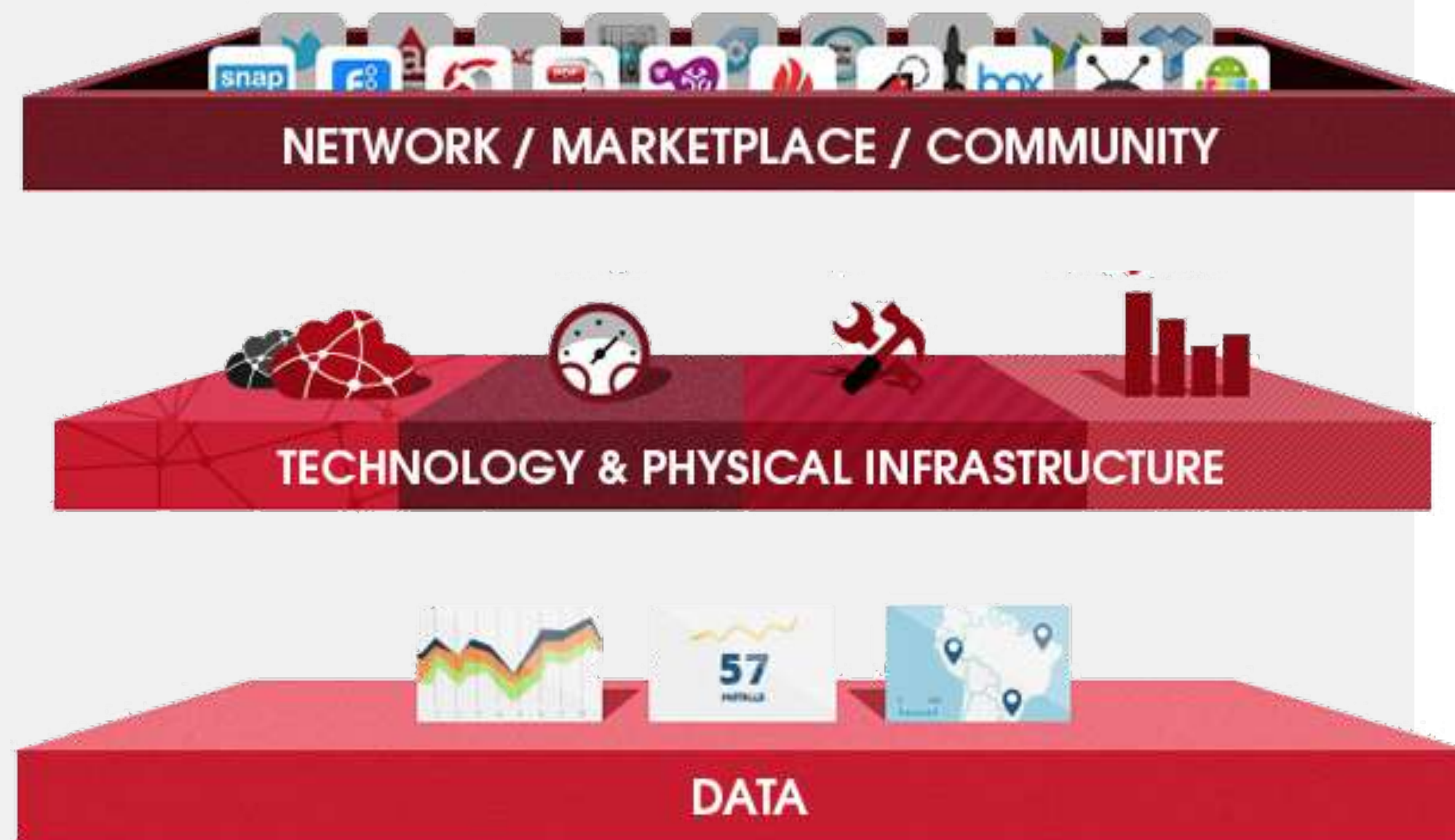
AR / VR

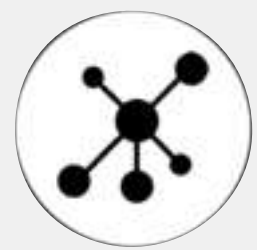




Platforms

Netflix utilising billions of datapoints per month to create to perfect customer proposition (combining content and consumption) to create engagement.





Platform stack: 3 basic configurations

Marketplace/Community-dominant

Examples: Marktplaats, Airbnb, Uber, Reddit, Funda, LinkedIn

The key source of value is the network.

NETWORK/MARKETPLACE/COMMUNITY

TECHNOLOGY INFRASTRUCTURE

DATA

Infrastructure-dominant

Android, Wordpress, Dropbox,

Development platform like Android, (provides the infrastructure on top of which apps may be created). Marketplace layer = App store

NETWORK/MARKETPLACE/COMMUNITY

TECHNOLOGY INFRASTRUCTURE

DATA

The Data platform

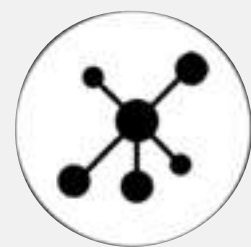
Platforms that often don't look like platforms. Examples: Jawbone, Nest, Tesla

The platform works like a pool into which, different sources bring in data and from which, different participants derive value.

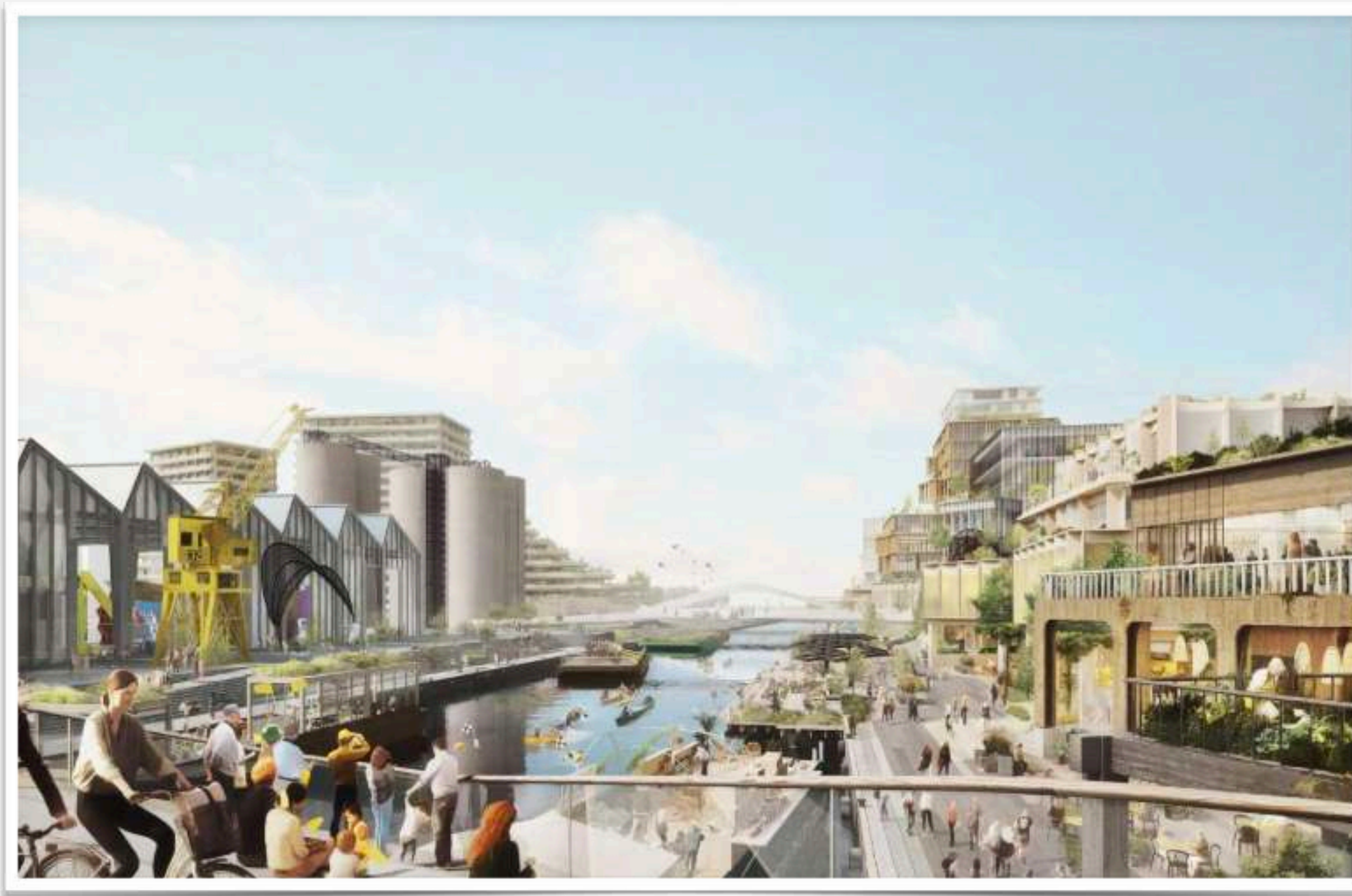
NETWORK/MARKETPLACE/COMMUNITY

TECHNOLOGY INFRASTRUCTURE

DATA



Platforms: Quayside Labs Toronto



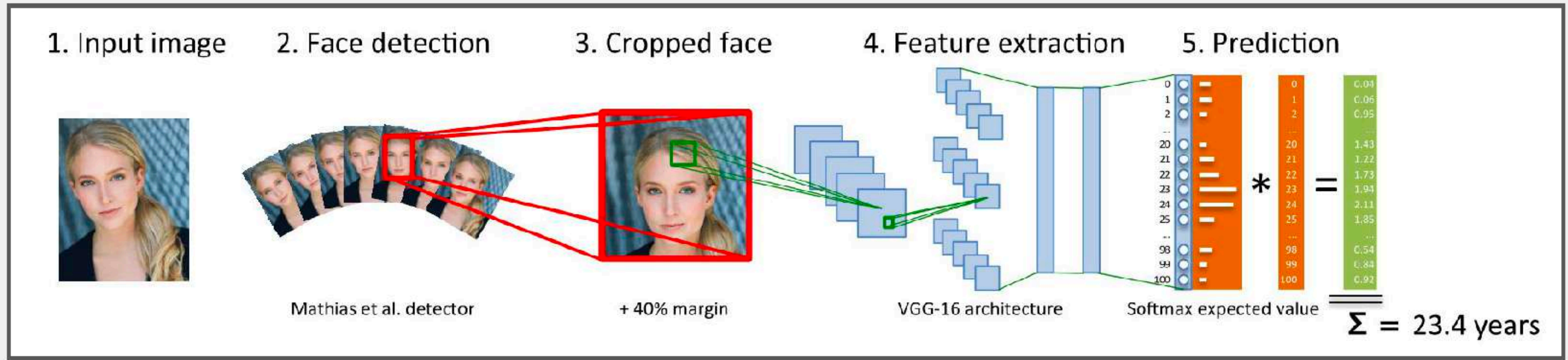
GOOGLE
PROJECTONTWIKKELAAR IN TORONTO



And one technology
to fuel them all..

AI & Neural networks

"Computers will overtake humans within the next 100 years. When that happens, we need to make sure computers have goals aligned with ours" - Stephen Hawking



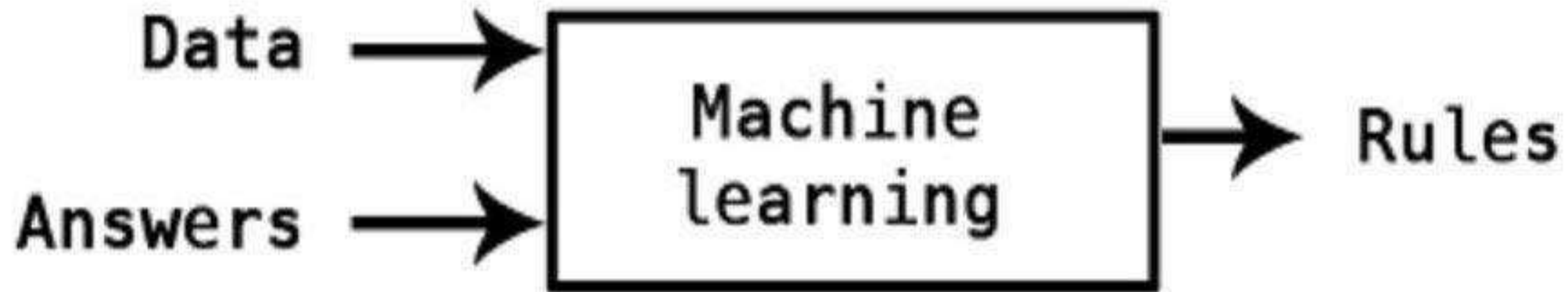
Expert Systems

Program the computer with a set of rules with expert knowledge or human behaviour.

Deep Learning

Feed data structures modelled on the human brain and let algorithms learn based on that data creating a neural network.

AI & Neural networks



“Is there a dog in this picture?”

After 50 years of work, computer vision systems got this right 72% of the time.

A whole class of similar problems – easy for people and hard/impossible for computers.

Consensus: decades more work.

Then, in 2012, machine learning.



The arrival of machine learning

Image recognition

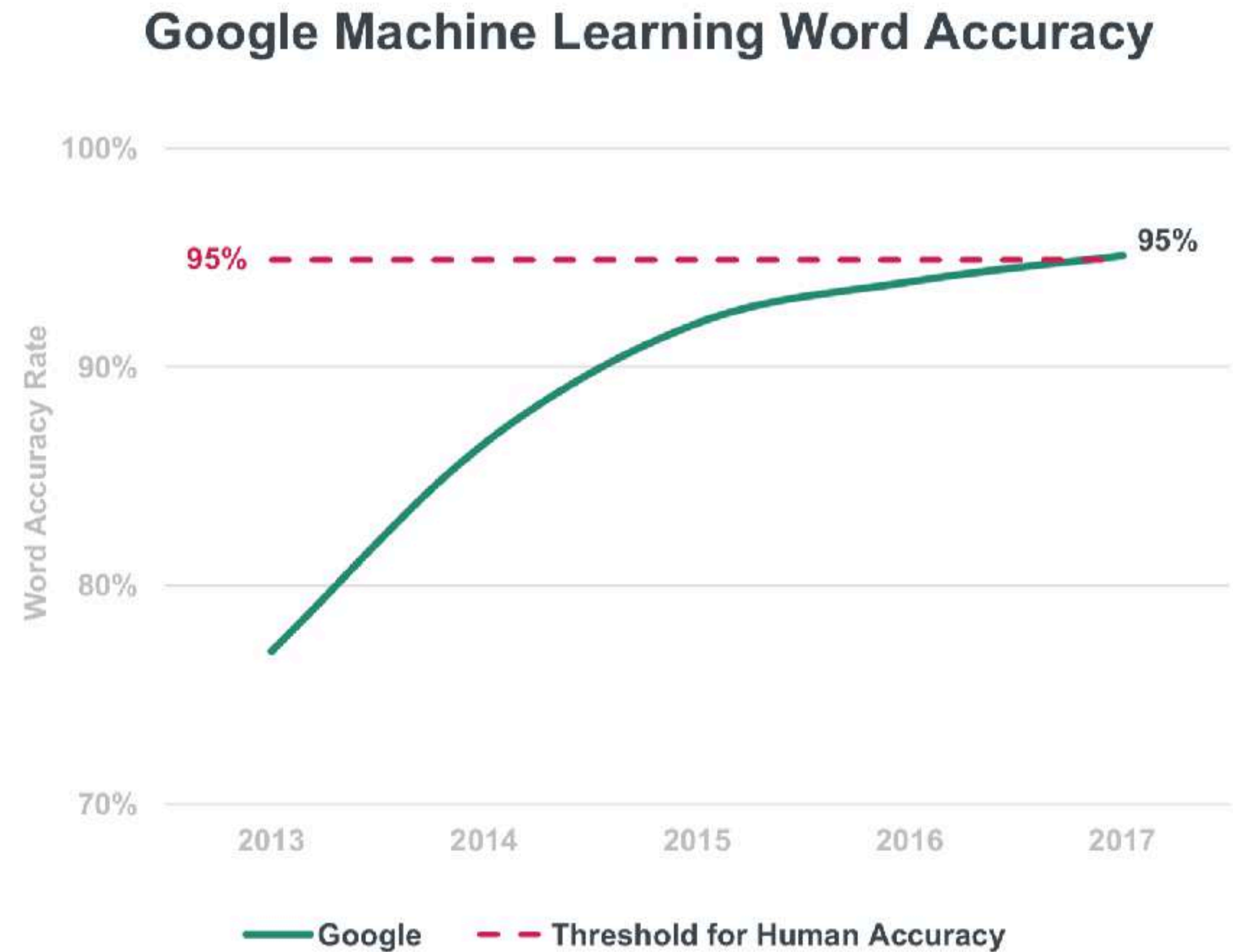
28% error rate 3-4%

Speech recognition

26% error rate 5%

Natural Language Understanding

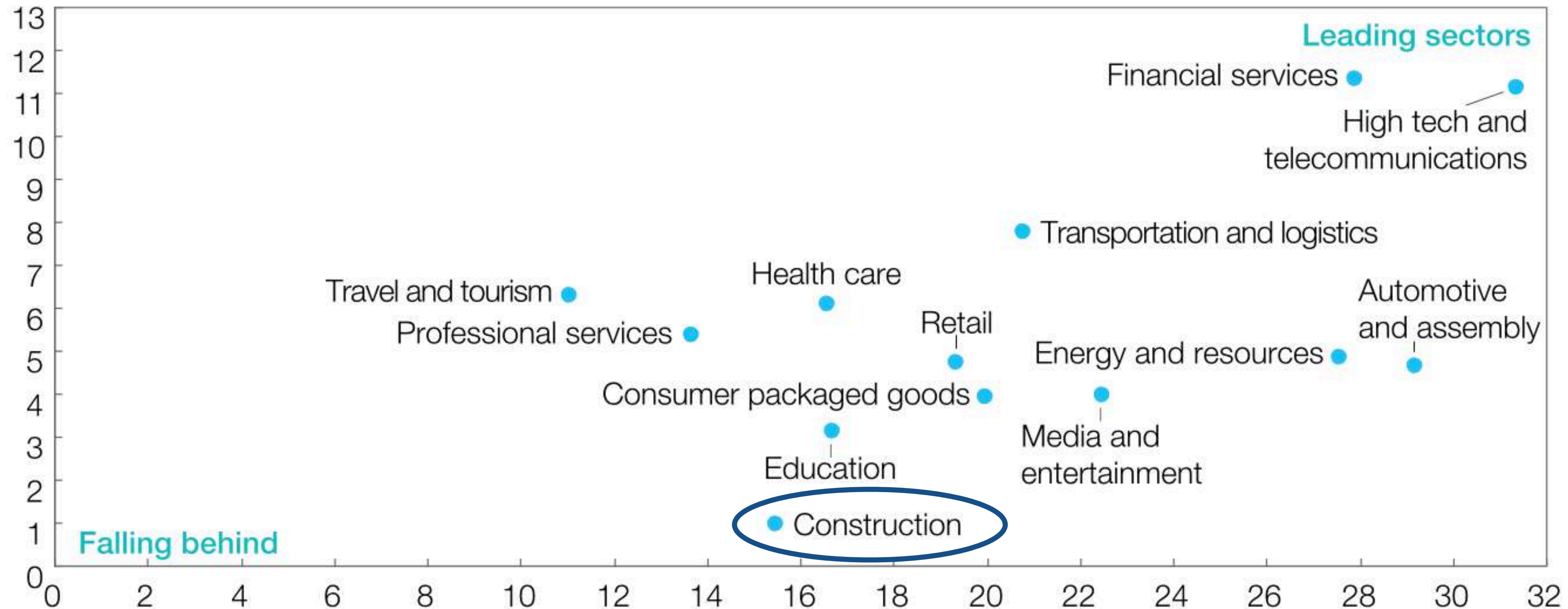
The arrival of machine learning...



Adoption of AI in construction is very low

Future AI demand trajectory¹

Average estimated % change in AI spending, next 3 years, weighted by firm size²



Current AI adoption

% of firms adopting one or more AI technology at scale or in a core part of their business, weighted by firm size²

Alice

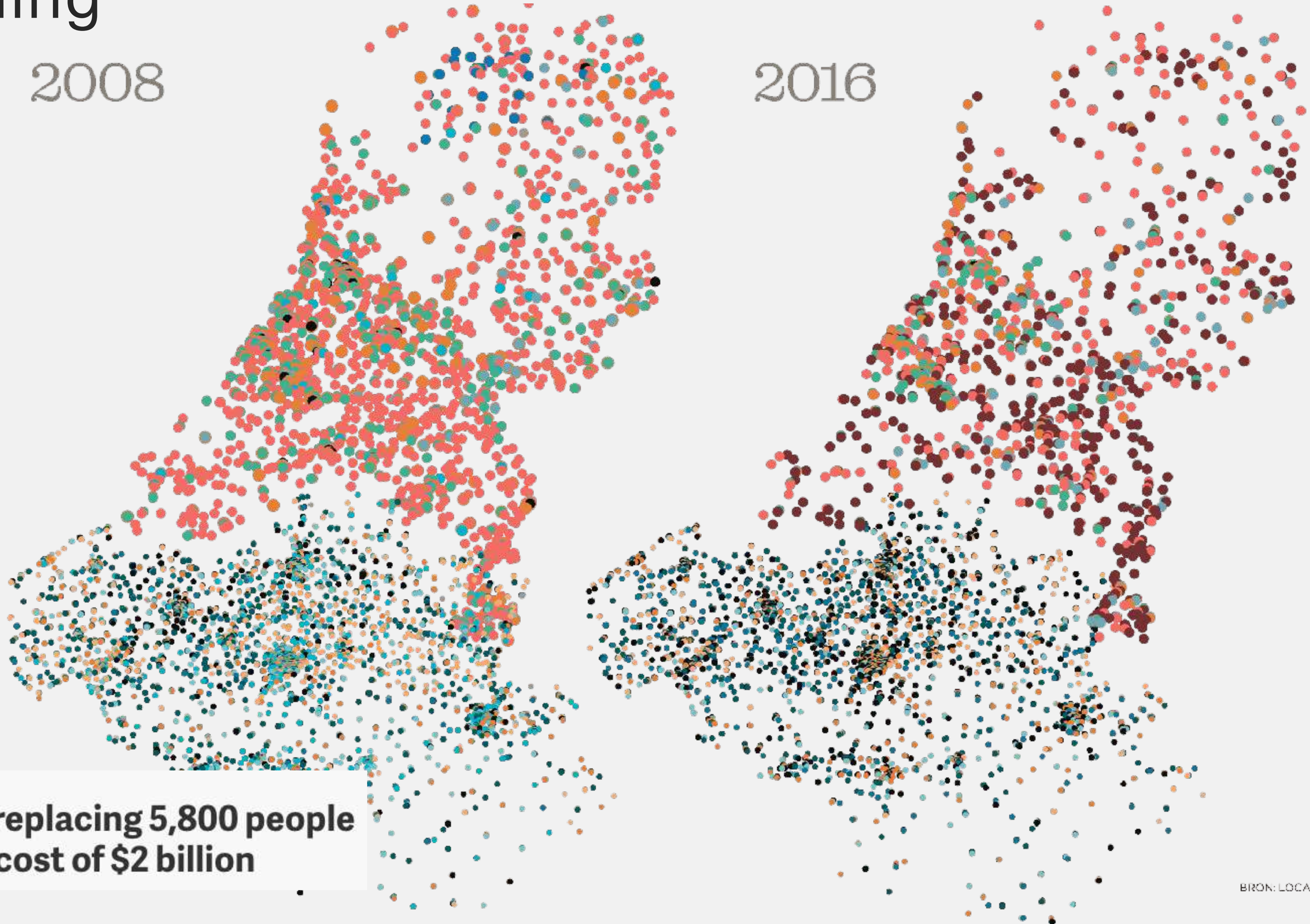


Impact

It's happening

2008

2016



NETWORK EFFECT

A big Dutch bank is replacing 5,800 people with machines, at a cost of \$2 billion

BRON: LOCATUS © FD



Impact



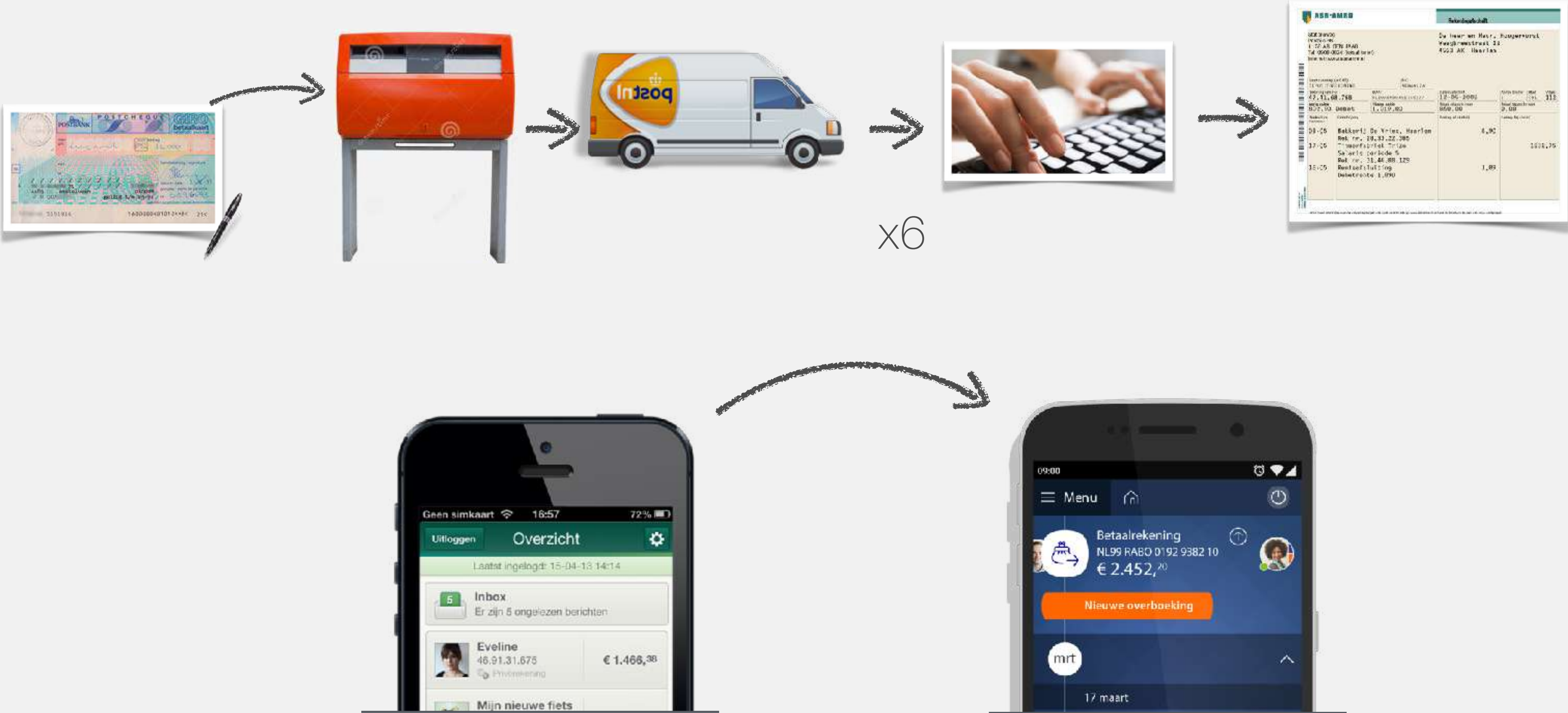
2008



2017

UBS trading floor in Stamford, Connecticut, US.

Impact | Business process optimisation



Removing steps in the proces



Predictive personalisation | from one-click to zero-clicks



Artificial intelligence is helping businesses create experiences that naturally integrate with consumers' everyday lives. Consumers will no longer change their pattern of communication when interacting with brands in order to satisfy their needs. Intelligent prediction and customization will make customers feel as if every product or brand experience was tailored just for them and also understands their emotion. A segment of 1.



Software eating the world

1960s

The office was a male-dominated environment- many women were still dependent on their husbands for income.

Technology was sparse, with workers producing documents with pen and paper. Due to the lack of technology, most of office employees had the same 9-5 working day as when the office closed connectivity was very limited.



1970s

In the 1970s more women were beginning to enter the workplace. The Equal Pay Act of 1970 made it illegal to pay women less for doing an identical job as men. This was followed by the Sexual Discrimination Act of 1975 which made it illegal to discriminate against women in education and recruitment.

In terms of technology, typewriters had become commonplace in the office environment. The more modern versions were designed to minimise noise in the workplace.



1980s

With Margaret Thatcher becoming Britain's first and only female Prime Minister, women were becoming more powerful in the working environment.

Typewriters were starting to be replaced by desktop computers and fax machines by the turn of the decade.



1990s

New technology was prevalent from the 1990s to the 2000s. Computers and fax machines were becoming common fixtures in the office environment – aiding in the growth of many global partnerships. Mobile phones were starting to become more accessible to the average person.



2000s

The dawn on the World Wide Web made working remotely much easier. Laptops and mobile phones made it easier for employees to be connected to the office 24 hours a day, 7 days a week. It was now uncommon for office workers not to have access to a computer.

Now

Technology dominates the work environment today- and is forever changing. Mobile devices such as tablets and smart phones, as well as cloud storage, have made it easy for people to connect with anyone, anywhere in the world.



Evolution of the Desk

1981

Software eating the world



Benedict Evans ✓
@BenedictEvans

Following

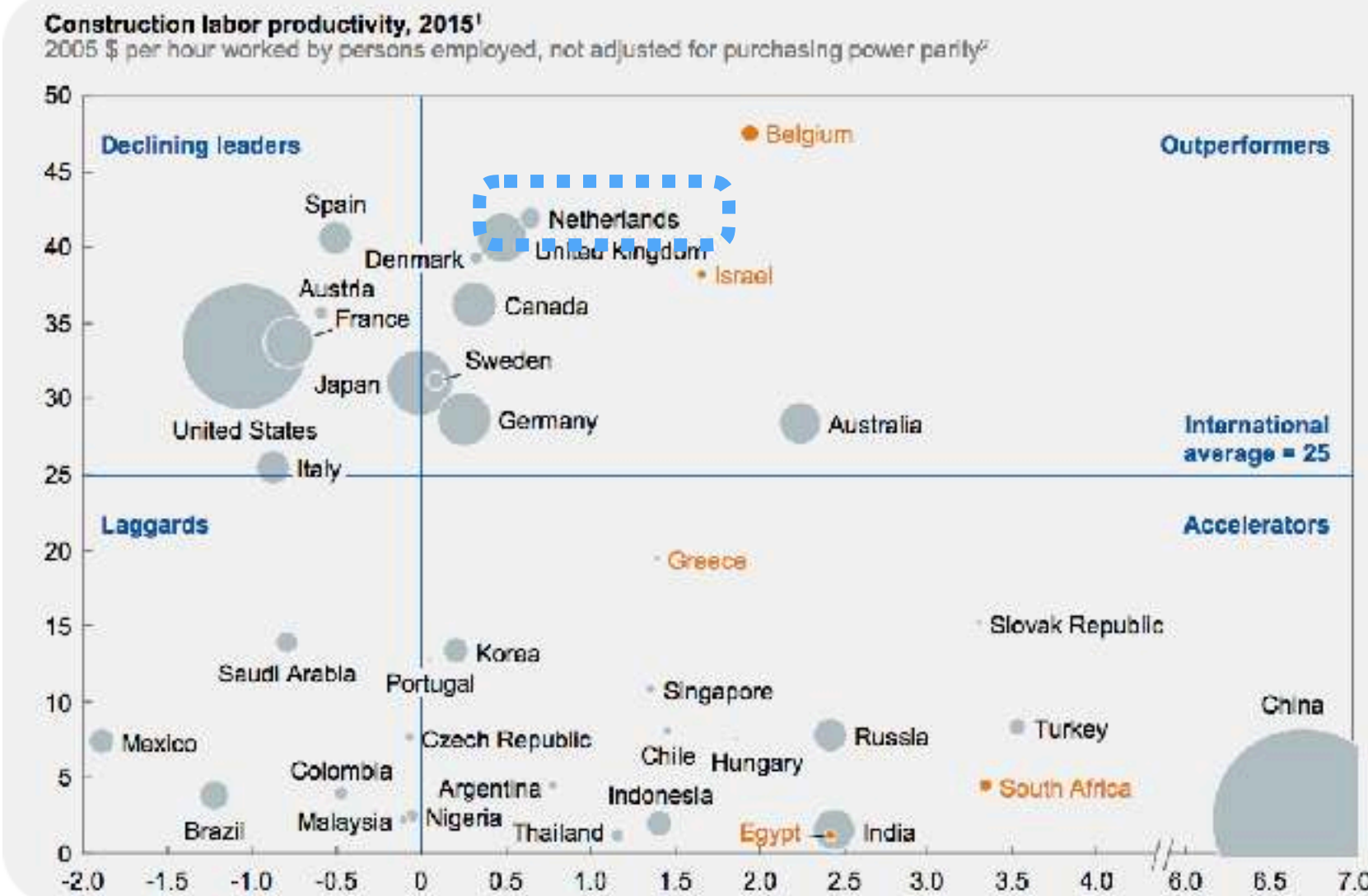
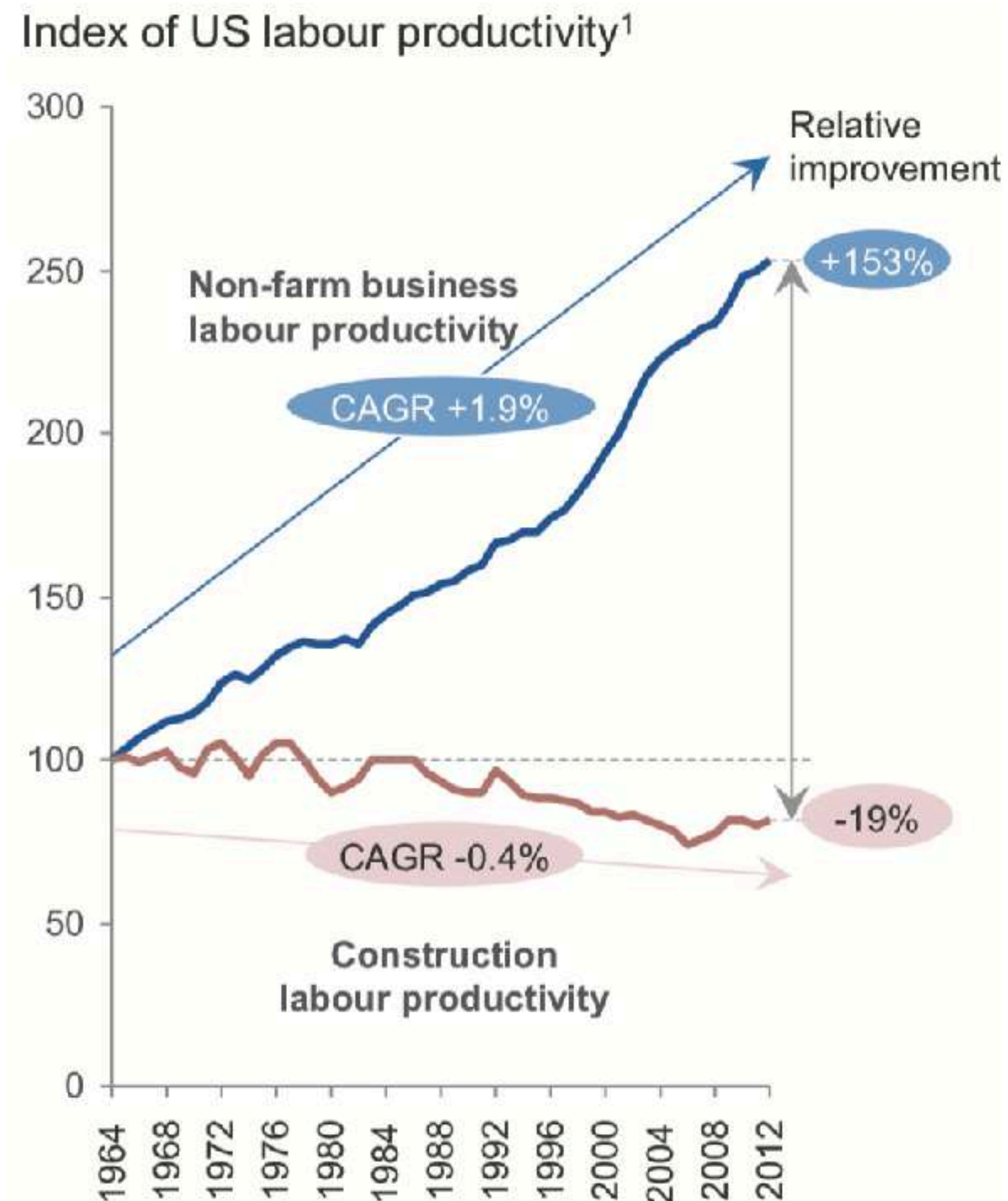


Software will eat the world, autonomy edition. Instead of this wonderful contraption to reconfigure the lanes twice a day, this will just be a software switch. Ultimately, there won't be any lanes.

The Future of Work

In US: Productivity in construction is declining

Figure 3: US Industry Productivity and Performance, 1964-2012²⁸



5–10x productivity boost

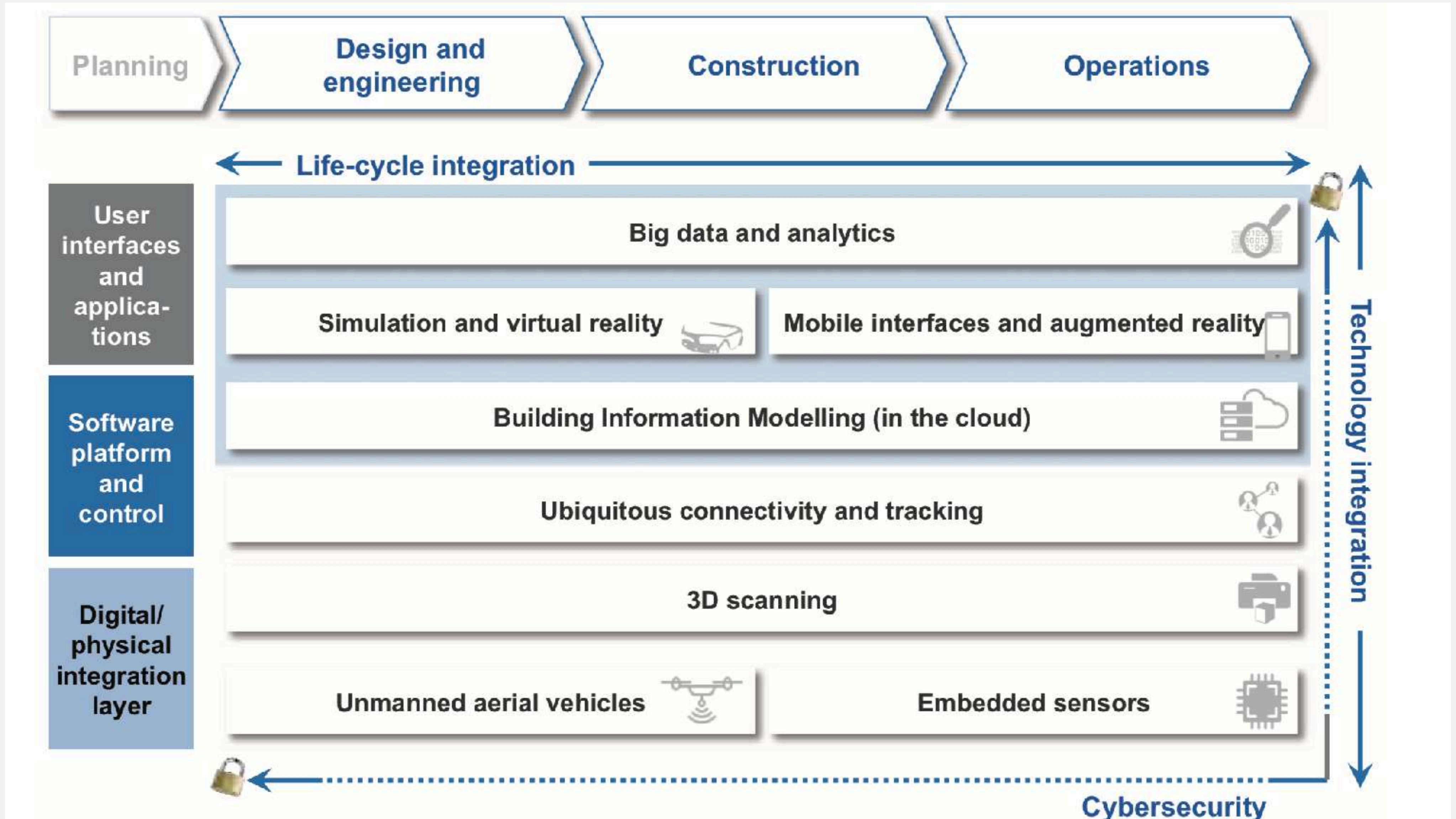
possible for some parts of the industry by moving to a manufacturing-style production system



Action in seven areas can boost sector productivity by 50–60%

- Reshape regulation
- Rewire contracts
- Rethink design
- Improve procurement and supply chain
- Improve onsite execution
- Infuse technology and innovation
- Reskill workers

Digital Technologies applied in E&C Value Chain



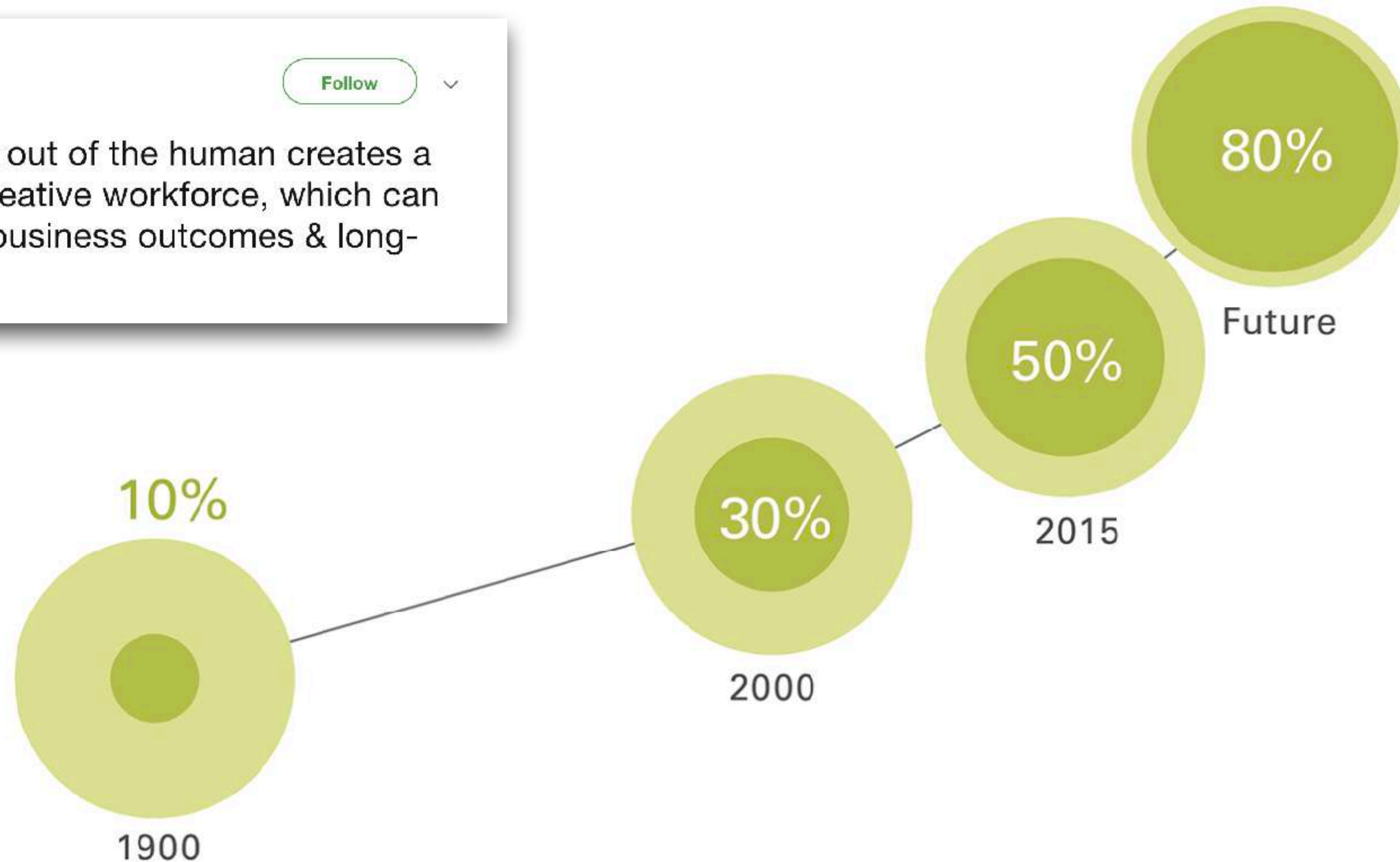
NOTE: THE FIGURE DISPLAYS THE MAIN APPLICATION AREAS OF THE RESPECTIVE DIGITAL TECHNOLOGIES ALONG THE E&C VALUE CHAIN. SOURCE: WORLD ECONOMIC FORUM; THE BOSTON CONSULTING GROUP

Employment & skills

Time humans spend doing uniquely human tasks



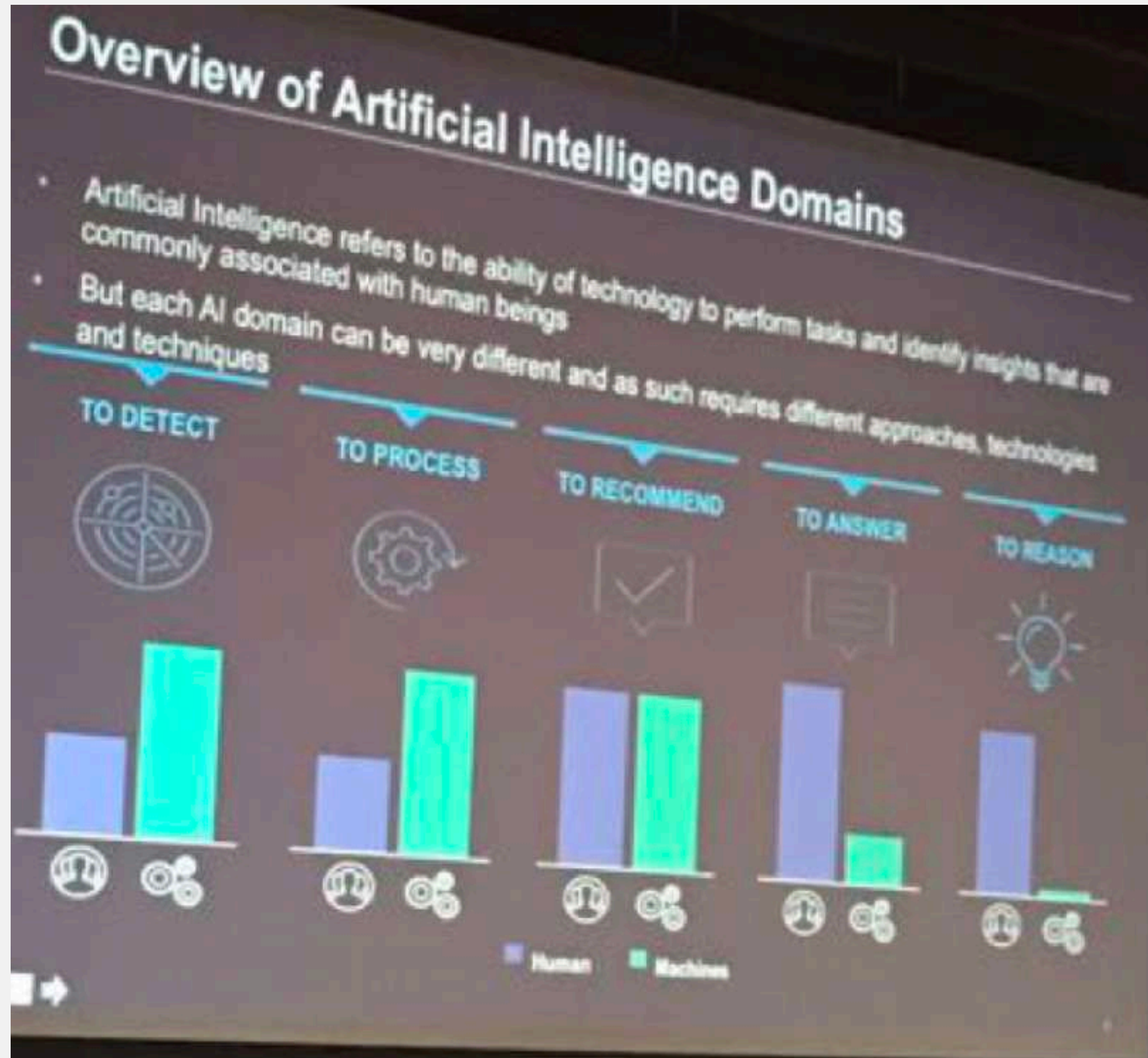
Taking the robot out of the human creates a happier, more creative workforce, which can lead to optimal business outcomes & long-term growth.



Sources: Vanguard calculations based on data from McKinsey & Company, U.S. Bureau of Labor Statistics, and U.S. Department of Labor O*NET OnLine.



Employment & skills



in 2020

1. Complex Problem Solving
2. Critical Thinking
3. Creativity
4. People Management
5. Coordinating with Others
6. Emotional Intelligence
7. Judgment and Decision Making
8. Service Orientation
9. Negotiation
10. Cognitive Flexibility

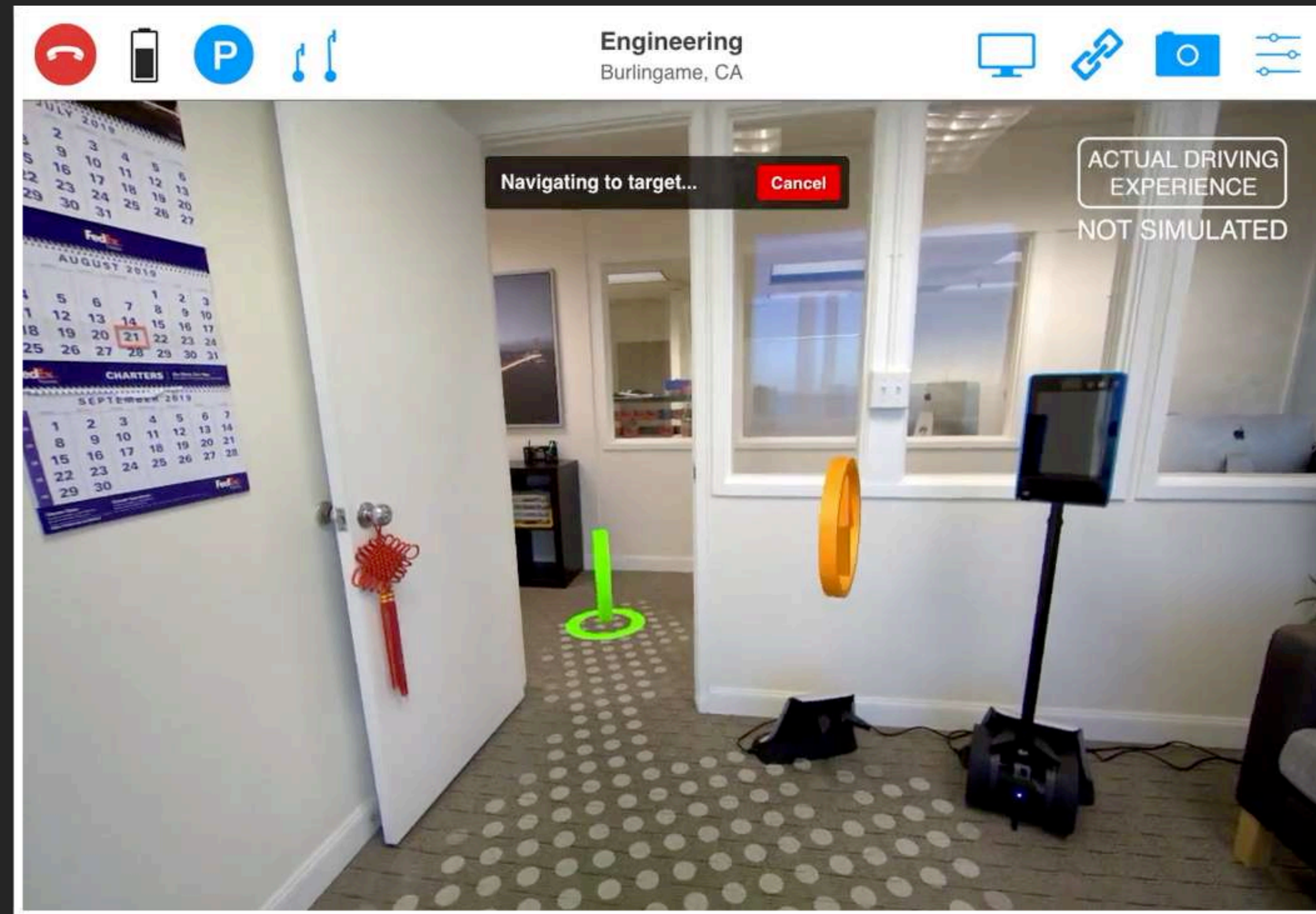


in 2015

1. Complex Problem Solving
2. Coordinating with Others
3. People Management
4. Critical Thinking
5. Negotiation
6. Quality Control
7. Service Orientation
8. Judgment and Decision Making
9. Active Listening
10. Creativity



Creativity in the office



Creativity in farming



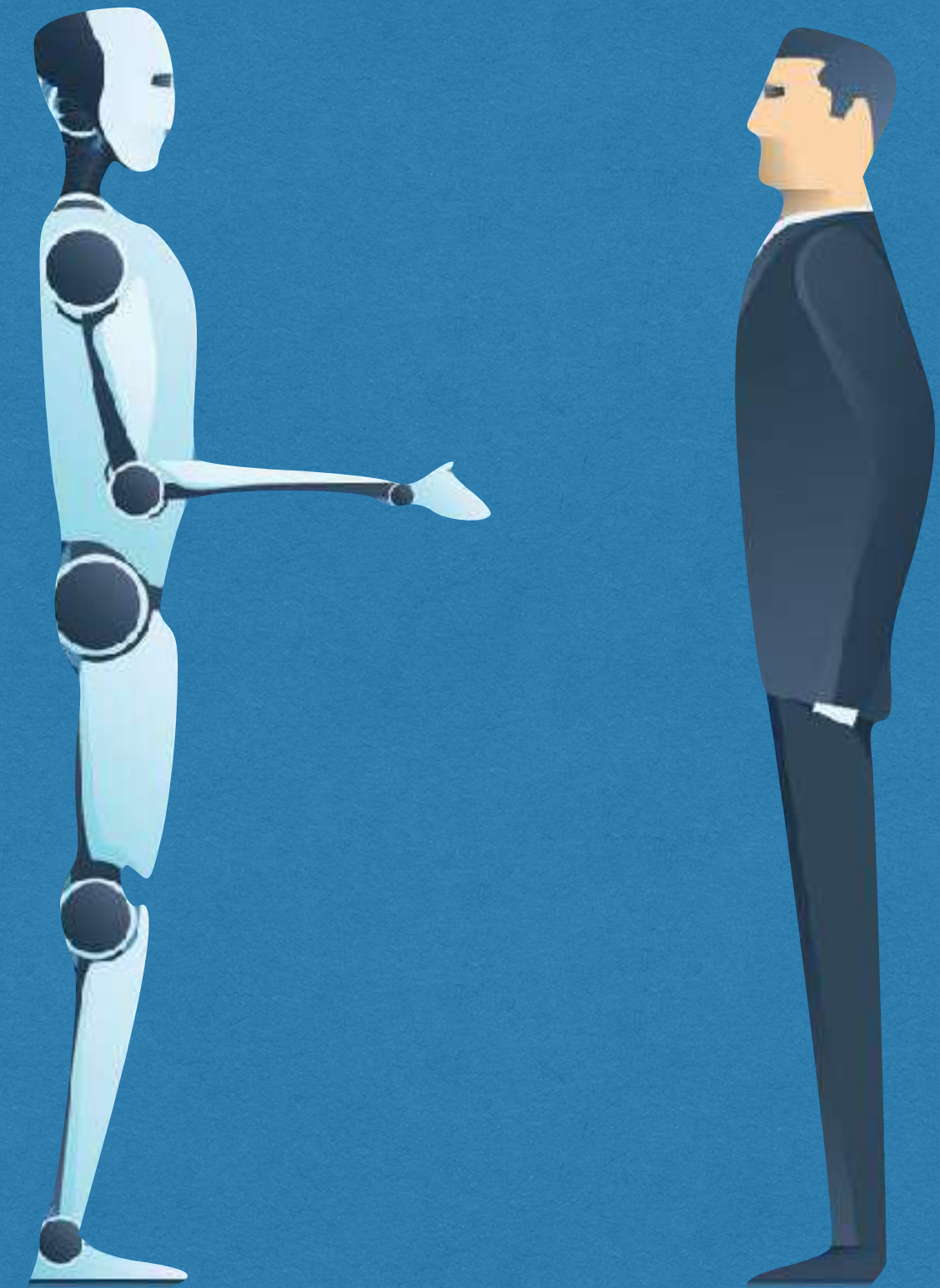
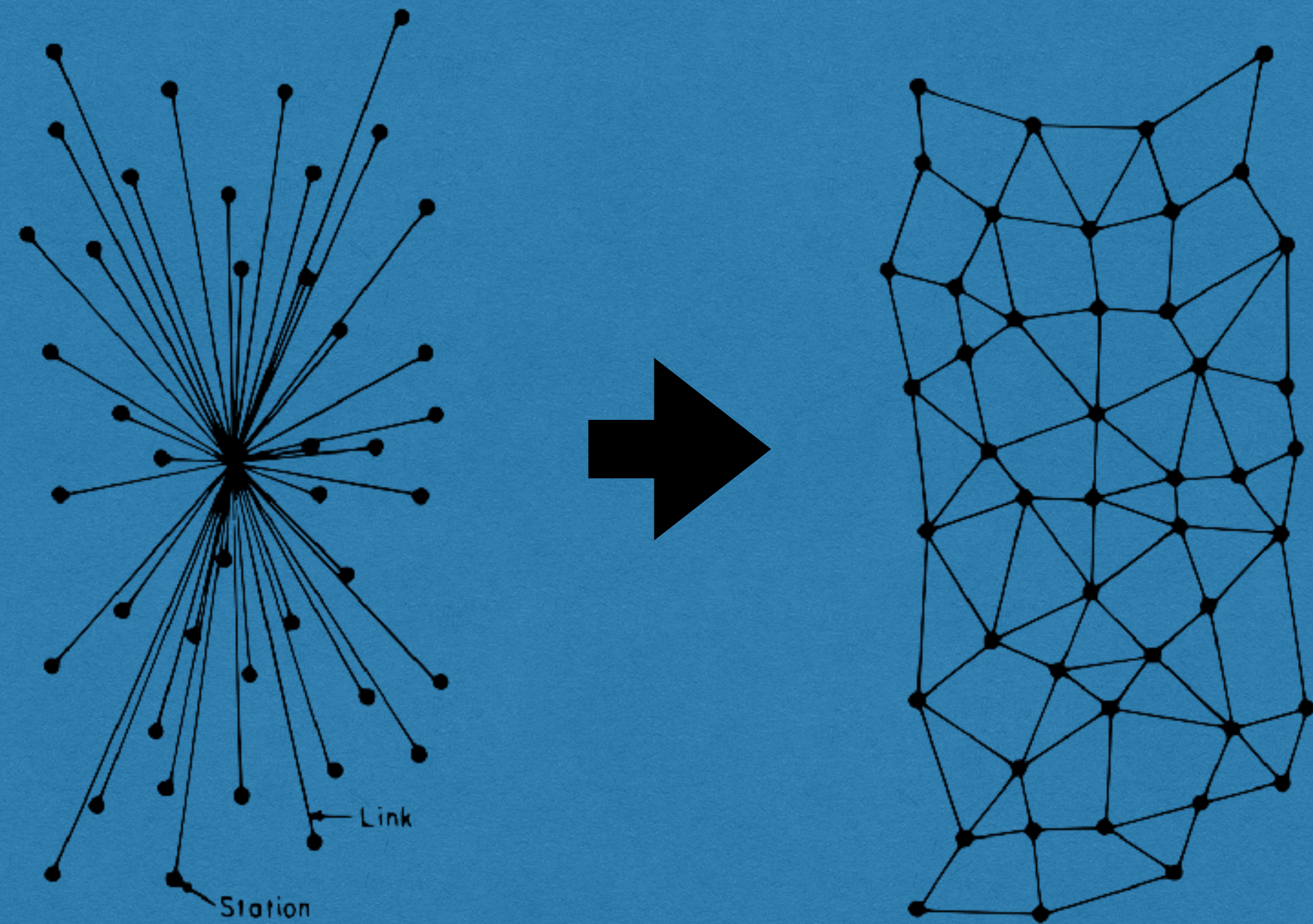
WORLD
ECONOMIC
FORUM

Aeroponic systems supply just
the right amount of **water**
and **nutrients**

Creativity in construction



The Future of Work | Workforce



Leading organizations have to craft a distributed workforce strategy that optimizes a diverse and augmented workforce of full and part time employees, contractors, crowds, and robots.

How the gig economy works



Best paid jobs in 2018 in the gig economy

1. Deep learning / artificial intelligence
2. Block chain architect
3. Robotics engineer
4. Ethical hacker
5. Cryptocurrency developer
6. AWS, Lambda coder
7. Virtual reality designer
8. Java developer
9. Final cut Pro editor
10. Instagram marketer

Amazon

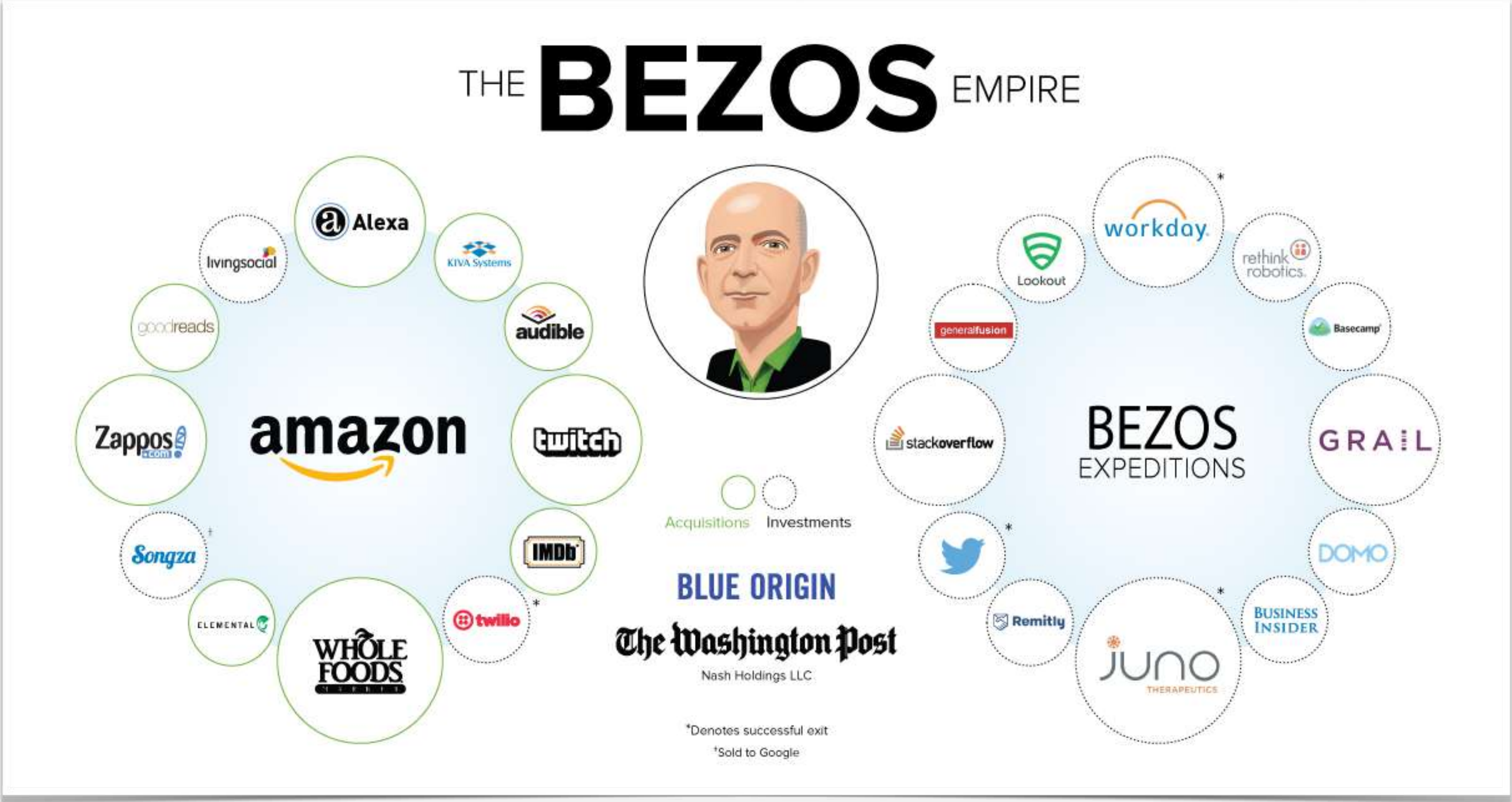


1994

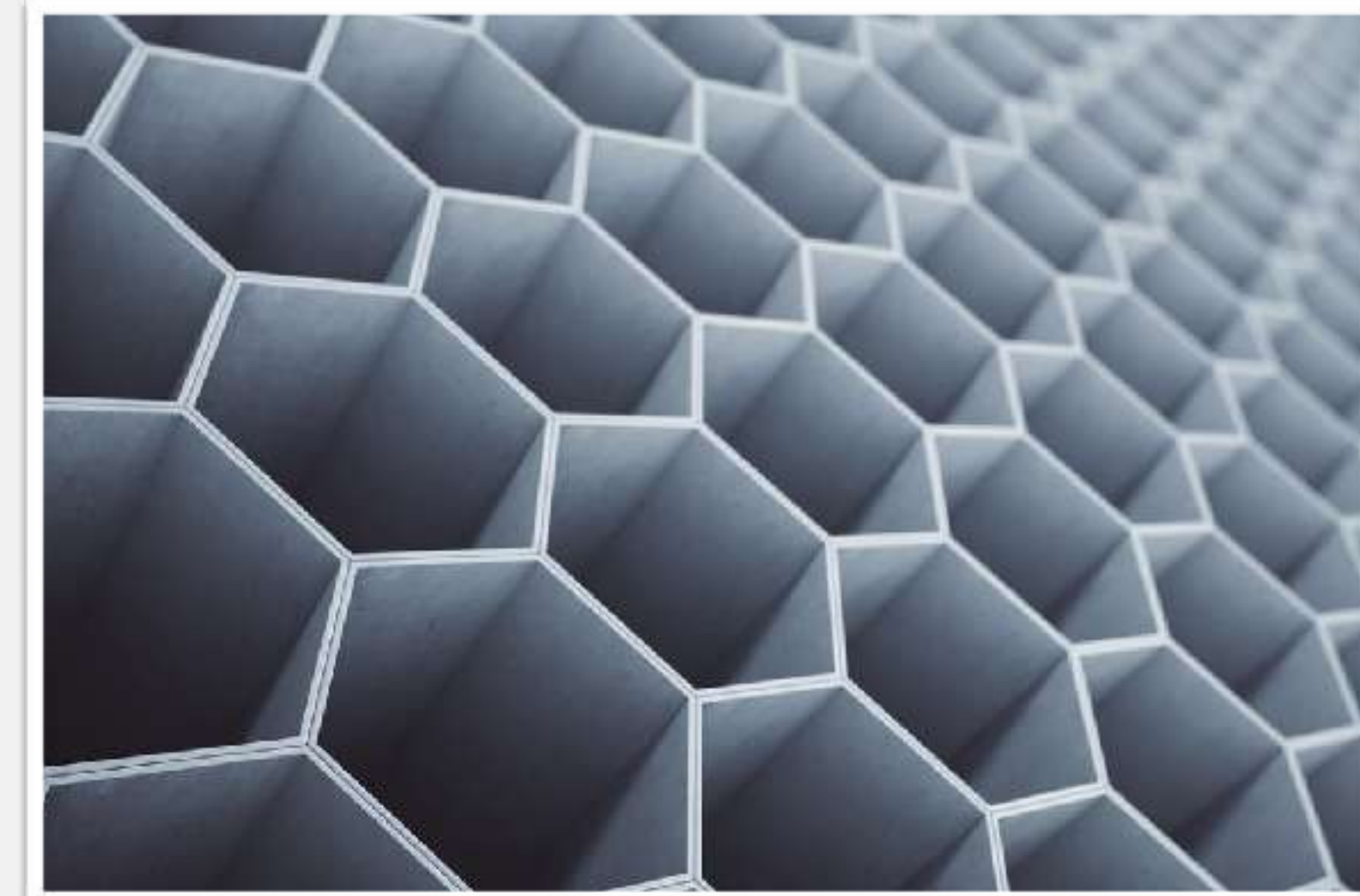


2018

Turn your company into a lab



Innovation and Transformation in Construction



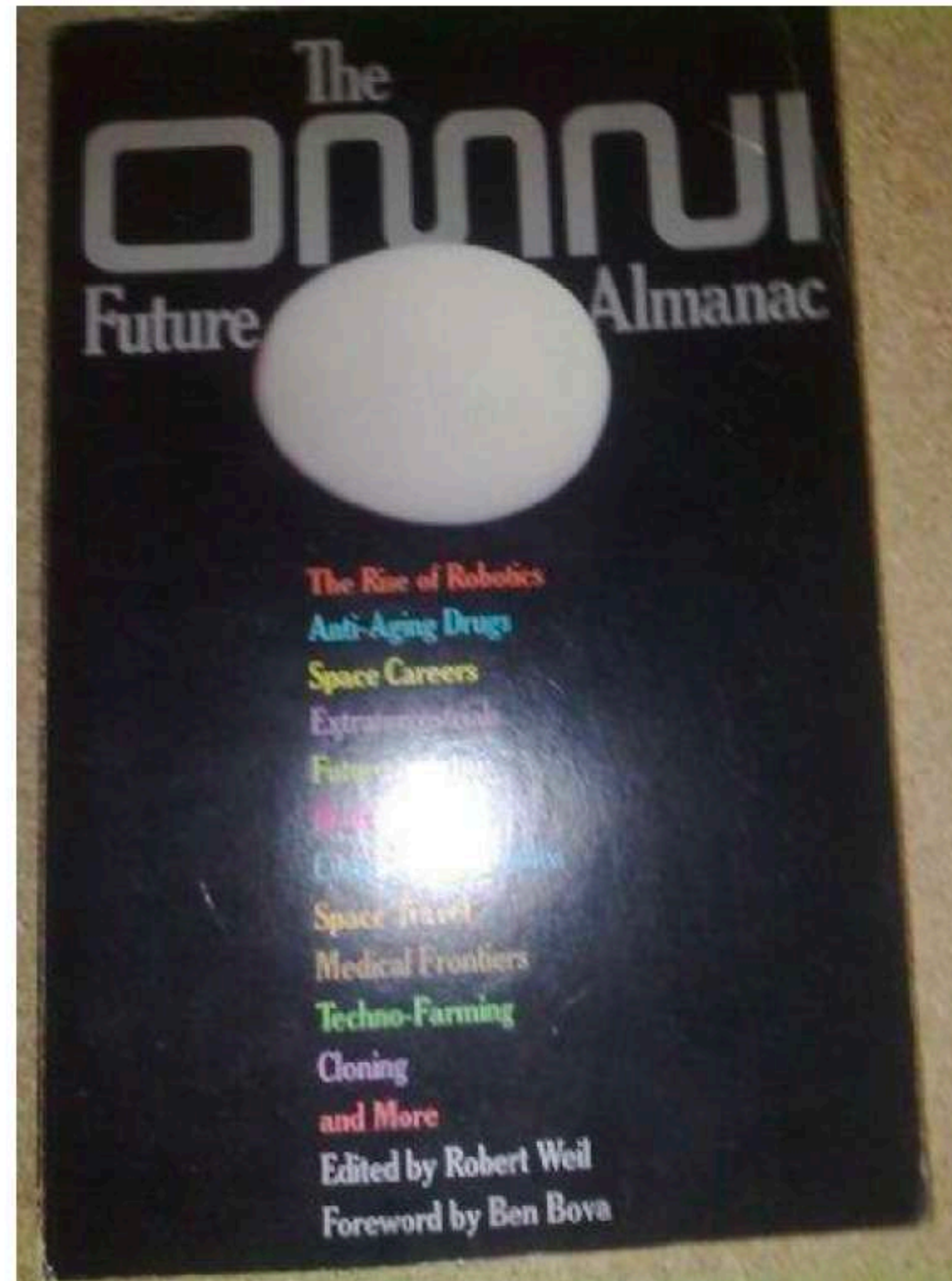
- 
- AUTOMATE & OPTIMIZE BUSINESS PROCESSES
 - INTEGRATE ECOSYSTEMS: SUPPLIERS, PARTNERS, EMPLOYEES, CUSTOMERS
 - DEVELOP A PERSONALIZED CUSTOMER JOURNEY
 - CREATE NEW DISRUPTIVE BUSINESS MODELS USING DATA & PLATFORMS

Predicting the
Future.....Really?

Historical predictions of the future of work

A few jobs *Omni's Future Almanac* (1982) predicted would be outmoded by technology:

- Grocery cashiers
- Farm workers
- Dry cleaners
- Small real estate brokers
- Door-to-door salespeople
- Toll booth operators
- Bank clerks
- Traditional telephone operators
- Typists



- Secretaries
- Art room staff (paste-up, letterer, graph maker, draftsman)
- File clerks
- "Paper" librarians
- Warehouse inventory person
- Warehouse packers
- Machine loaders
- Machinists

Transition



Shanghai 1990



Shanghai 2010

Transition



1900



1913

13 years

Thank you!

Questions? richard@sound.team



