



MANAGING COMPLEXITY

Wilco Dekker
1 Mei 2018 Dutch Guild

MANAGING COMPLEXITY

1. The world around us
2. Generic observations
3. Logical evolution
4. Capacity
5. A different model

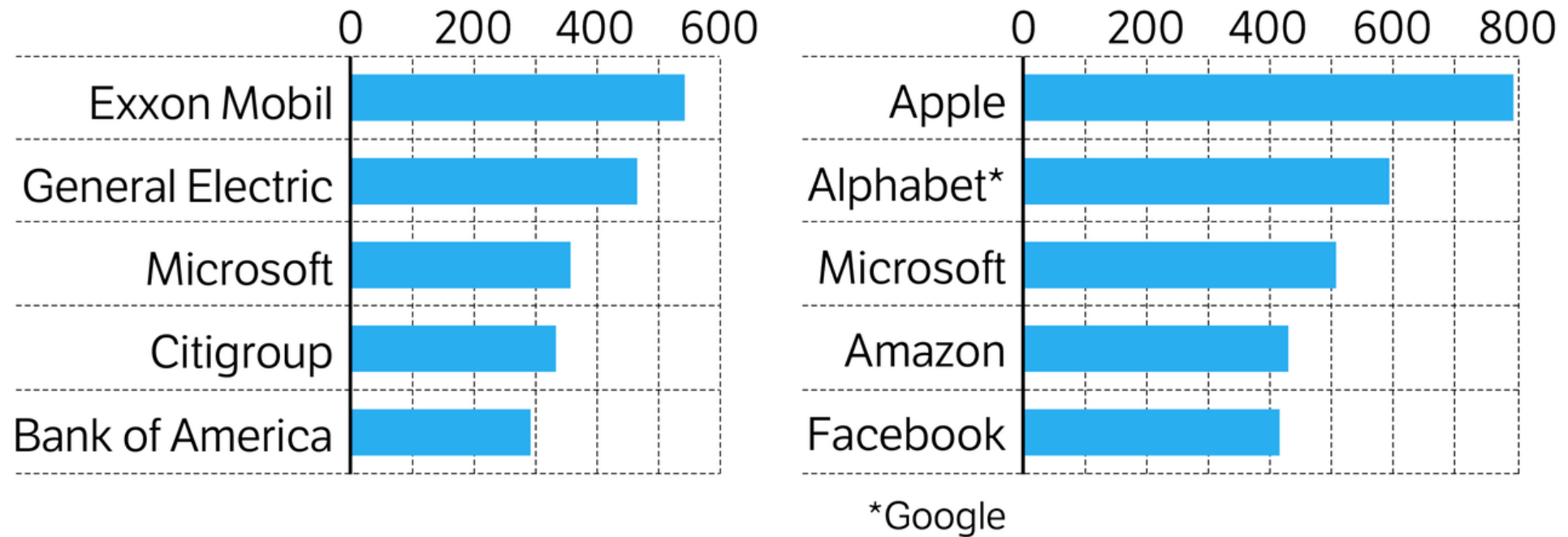
**Think Exponentially,
Pay Attention**



1. THE WORLD AROUND US

TECHNOLOGY DRIVEN

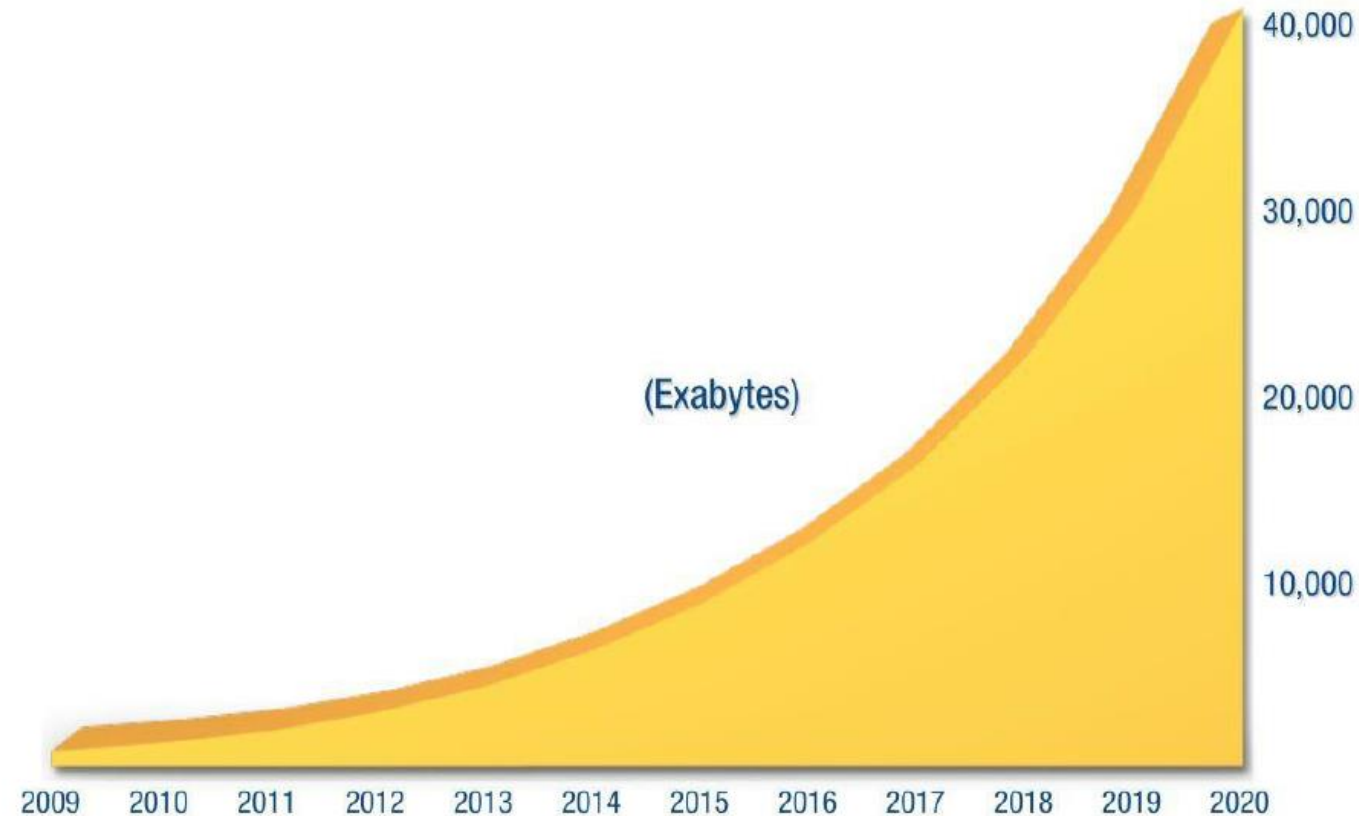
Grootste bedrijven naar beurswaarde in 2006 en 2017, in miljarden dollars



NRC 290417 / YP / Bron: S&P Dow Jones Indices

DATA GROWTH

The Digital Universe: 50-fold Growth from the Beginning of 2010 to the End of 2020



IDC projection

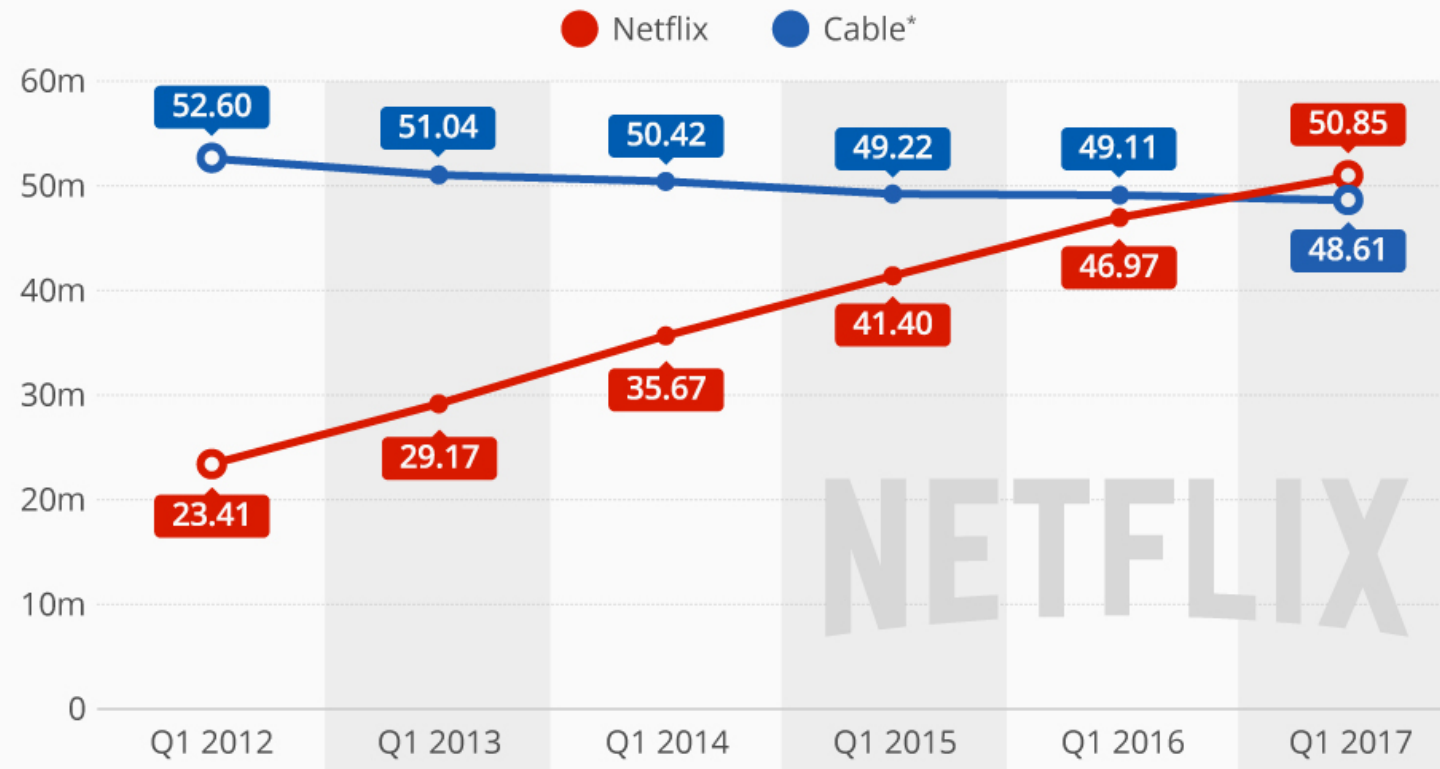
The amount of data collected

This IDC graph predicts exponential growth of data from around 3 zettabytes in 2013 to approximately 40 zettabytes by 2020. An exabyte equals 1,000,000,000,000,000 bytes and 1,000 exabytes equals one zettabyte. Source: IDC's Digital Universe Study, December 2012, <http://www.emc.com/collateral/analyst-reports/idc-the-digital-universe-in-2020.pdf>.

CHANGE

Netflix Surpasses Major Cable Providers in the U.S.

Number of Netflix subscribers vs. cable pay-TV subscribers in the U.S. (in millions)



* includes major cable providers accounting for roughly 95% of cable subscribers and slightly less than half of all multichannel pay-TV subscribers

Sources: Netflix, Leichtman Research Group



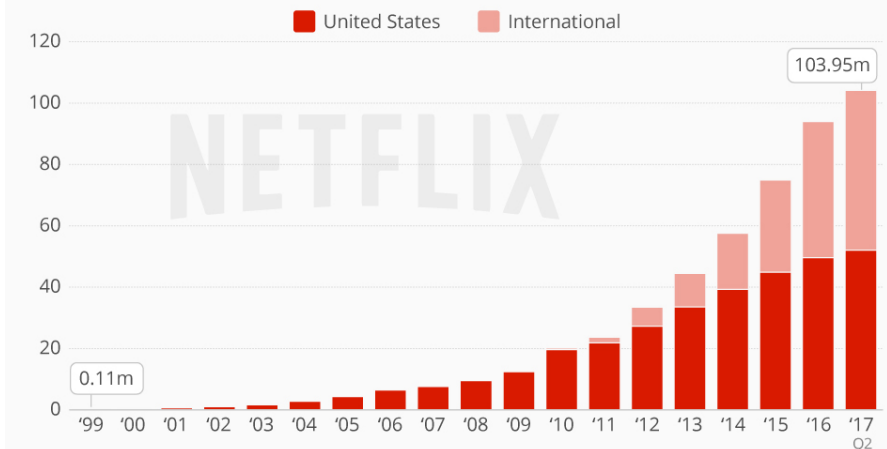
@StatistaCharts

statista

“We are leaving the traditional world”

Netflix Turns 20

Number of Netflix subscribers at the end of the respective period*



* subscriber figures from 2011 onwards exclude DVD subscribers; Netflix started streaming movies to subscribers in 2007 and split its DVD-by-mail service from the streaming business in 2010.

Source: Netflix



@StatistaCharts

statista

THE WORLD AROUND US



Are we changing as fast as the world
around us?

— Gary Hamel —

AZ QUOTES

2. GENERIC OBSERVATIONS

GENERIC OBSERVATIONS

What is happening in the market:

- We are in an era of exponential growth
- Customer behavior
- Customer demand and usage

This will result into:

- Business Models will change
- Network Architecture & platforms will change
- Employee profiles will change
- Organisation structure will change (holacratic)
- Customer expectations will rise



GENERIC OBSERVATIONS

What new areas need to be embraced:

- Software Defined Networks
- 5G / Fixed Wireless Access
- Artificial Intelligence
- Internet of Things (IoT)
- Cloud computing (GCP/AWS)
- Blockchain / PDS
- Brain Computer Interface
- Quantum Mechanics

Self provisioning networks / Self creating connections

Wireless access

Outsource complexity

Track everything

Scalable

Trusted environment

Convenience

Faster

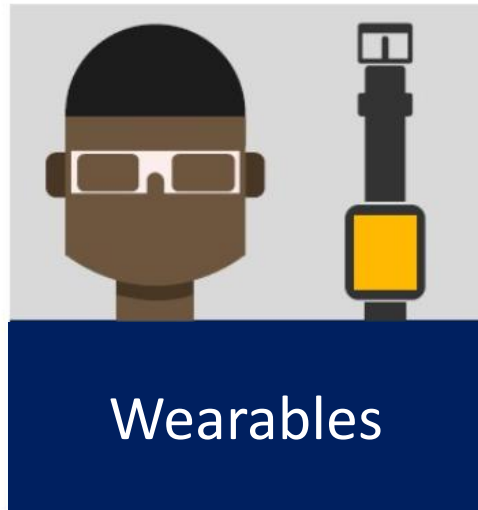
Examples of merging markets & products:

- WeChat (Tencent)
- Amazon/Echo/Whole Foods/Ring
- IFTTT

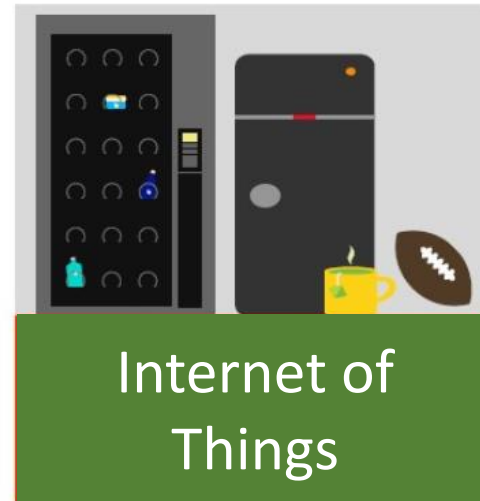
if  this then  that

GENERIC OBSERVATIONS

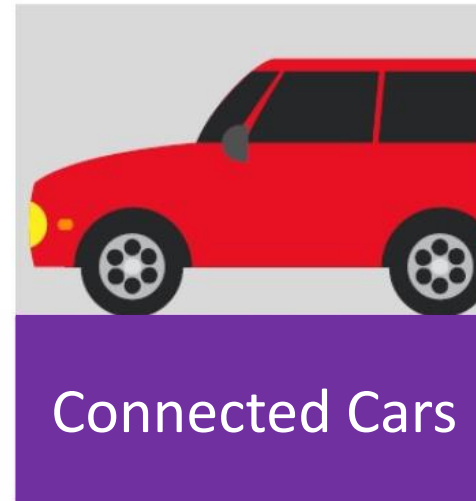
IoT Everywhere



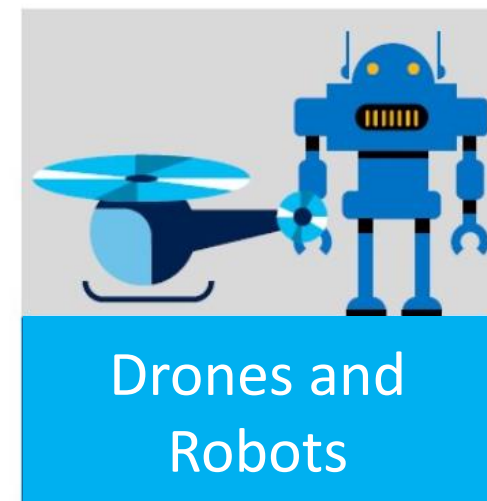
Smart Watches
Fitness Bands
Glasses
Jewelry
Clothing
Biometrics



Appliances / Sports
Gear / Mattresses /
Displays / Mirrors /
Lamps / Elevators /
Cows / Electricity /
Water / Gas /
Security / Etc.



Car apps
Autonomous cars
Virtual cockpit
Integration with
wearables



Cameras
Games
Toys
Transport

GENERIC OBSERVATIONS

IBM Creates World's Smallest Computer for Blockchain Technology

By Ryan Whitwam on March 19, 2018 at 4:01 pm | 9 Comments

f t G+ Y 2.3K SHARES

Computers are shrinking rapidly. You can build a pretty capable little machine powered by a device like the Raspberry Pi, but that's still huge compared with IBM's latest machine. The company that started out selling massive mainframe computers has developed the world's smallest computer. Each one is smaller than a grain of salt, but it packs more computing power than you'd expect.



64 boards on the left versus a single computer on the right.

Adding a computer to everything sounds expensive, but IBM doesn't think that will be the case. A final version of the microscopic computer could cost as little as 10 cents per unit to manufacture. IBM expects to begin offering these "crypto-anchor" micro-computers to customers in the next 18 months or so. At that point, it will be up to industry to devise a blockchain system to authenticate goods. IBM believes this technology will become commonplace in the next five years.

<https://www.extremetech.com/computing/265917-ibm-creates-worlds-smallest-computer-blockchain-tech>

Nano Technology:

- **All Nano (smaller)**

- IBM: X86 processor the size of a rice grain

Trend

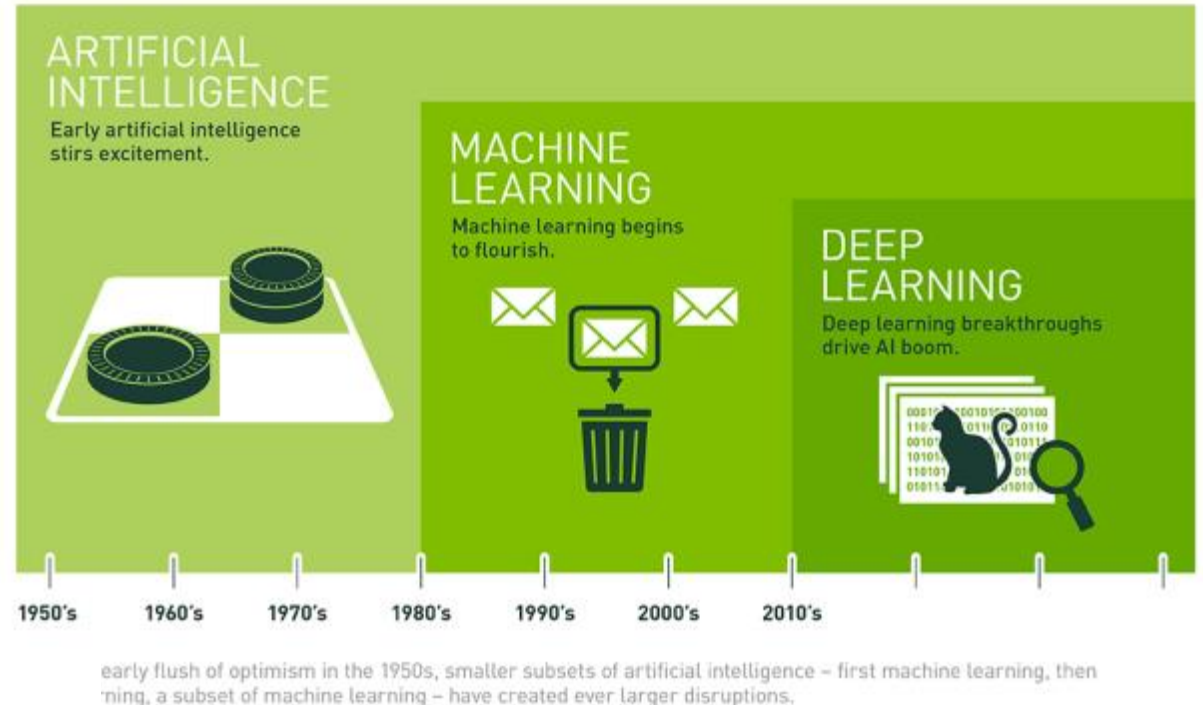
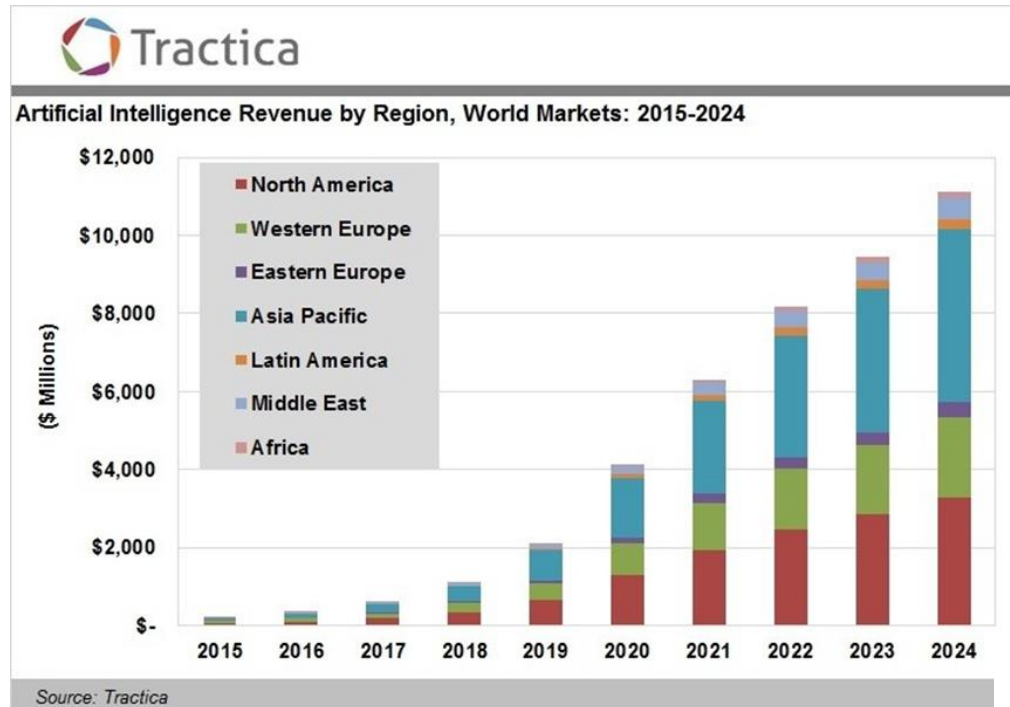
- Everything is getting smaller, with more functions
- Integration of more features in the same device
- More devices will disappear
- Long term: STB/CM will integrate in mobile device/implant

GENERIC OBSERVATIONS

Example of technologies that will disrupt the market

Over the past few years Artificial Intelligence has exploded, and especially since 2015:

- flood of data (big data movement)
- infinite storage in the cloud
- wide availability of GPUs (Graphics Processing Unit)



CHANGE

CEO / CTO / CIO / CFO / CCO

**New areas
of attention**



CEO / CTO / CIO / CFO / CCO

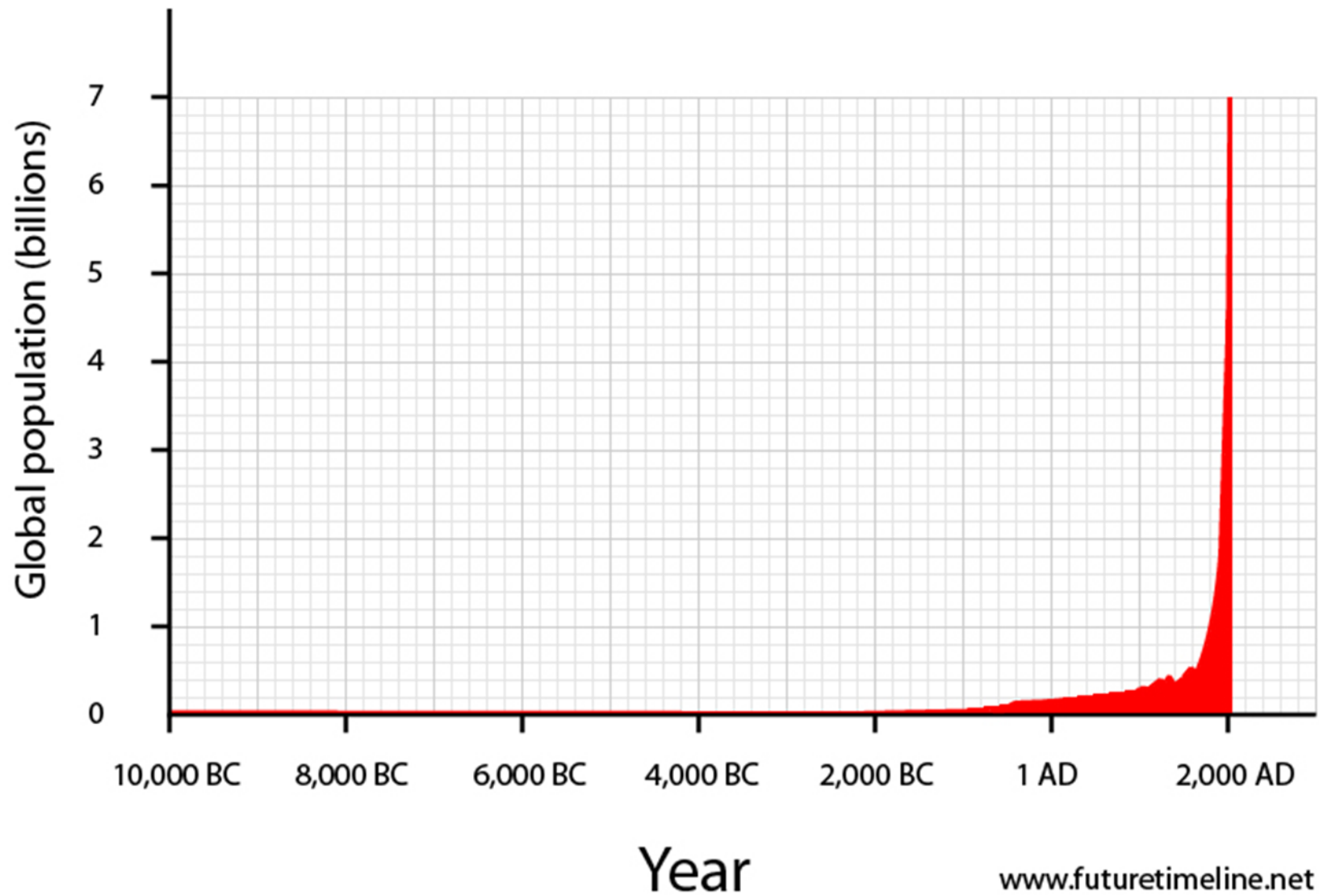
1. Chief Evolution Officer
2. Chief Transparency Officer
3. Chief Innovation Officer
4. Chief Failure Officer
5. Chief Capacity Officer

**New areas
of attention**

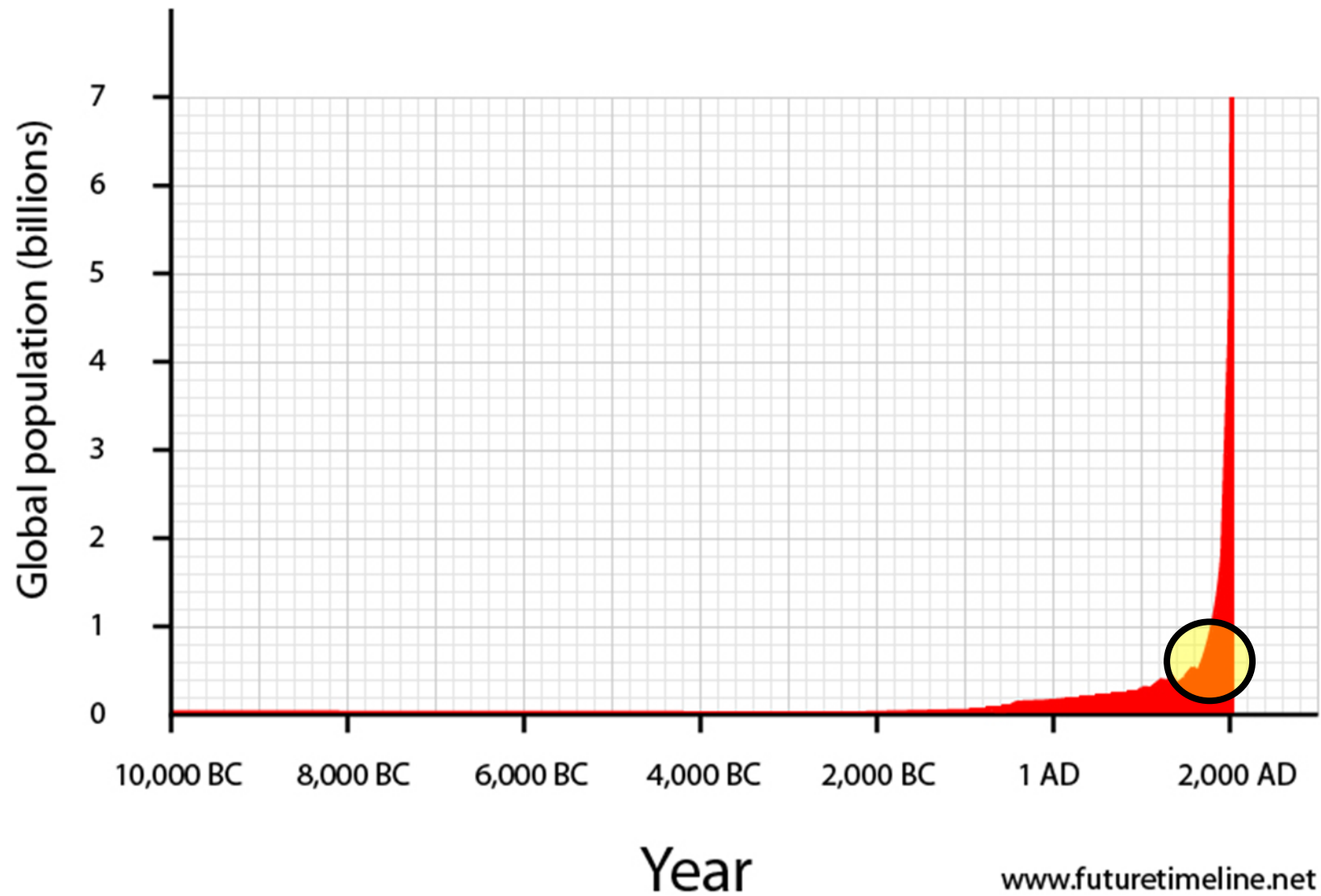


3. LOGICAL EVOLUTION

LOGICAL EVOLUTION

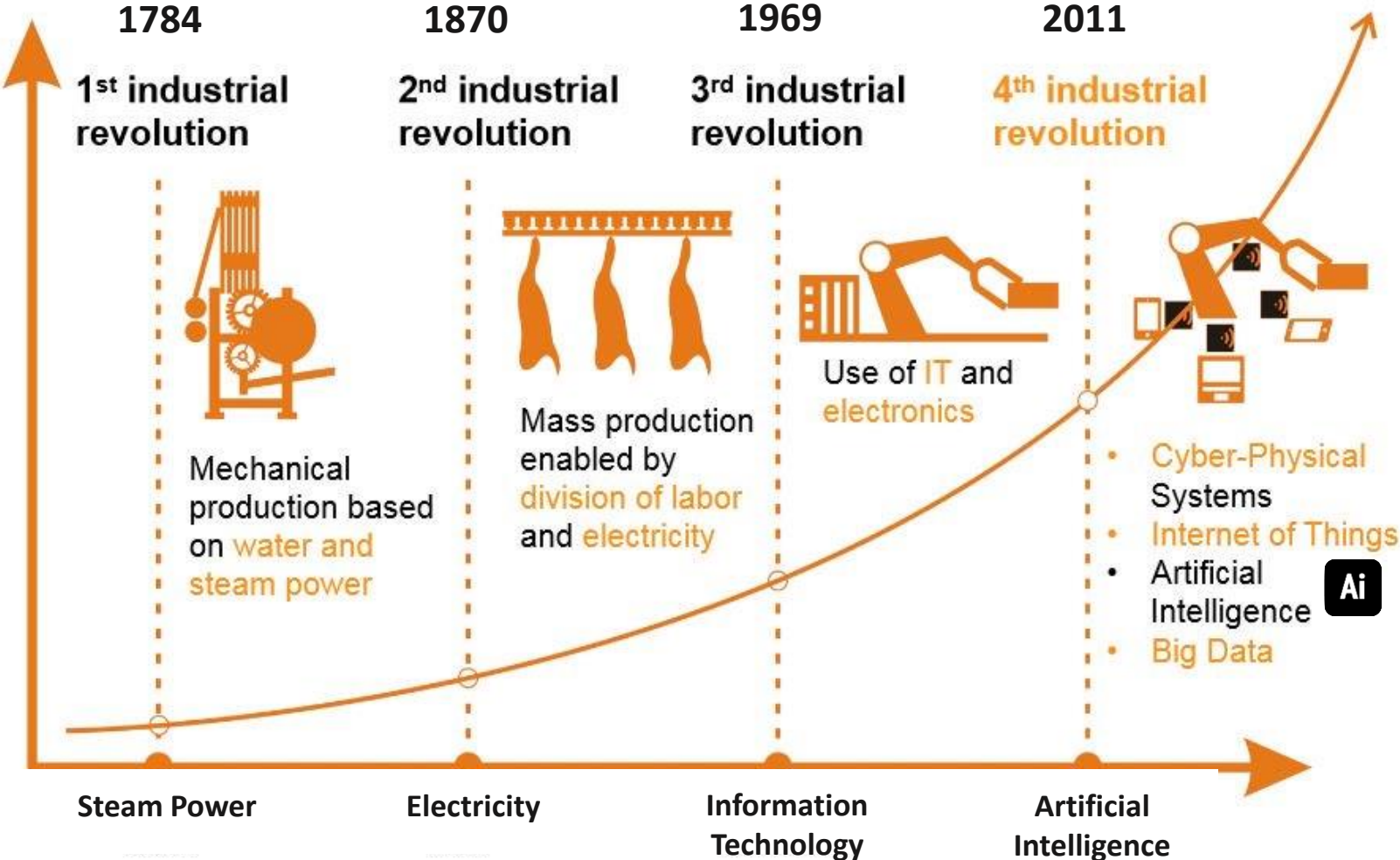


LOGICAL EVOLUTION



LOGICAL EVOLUTION

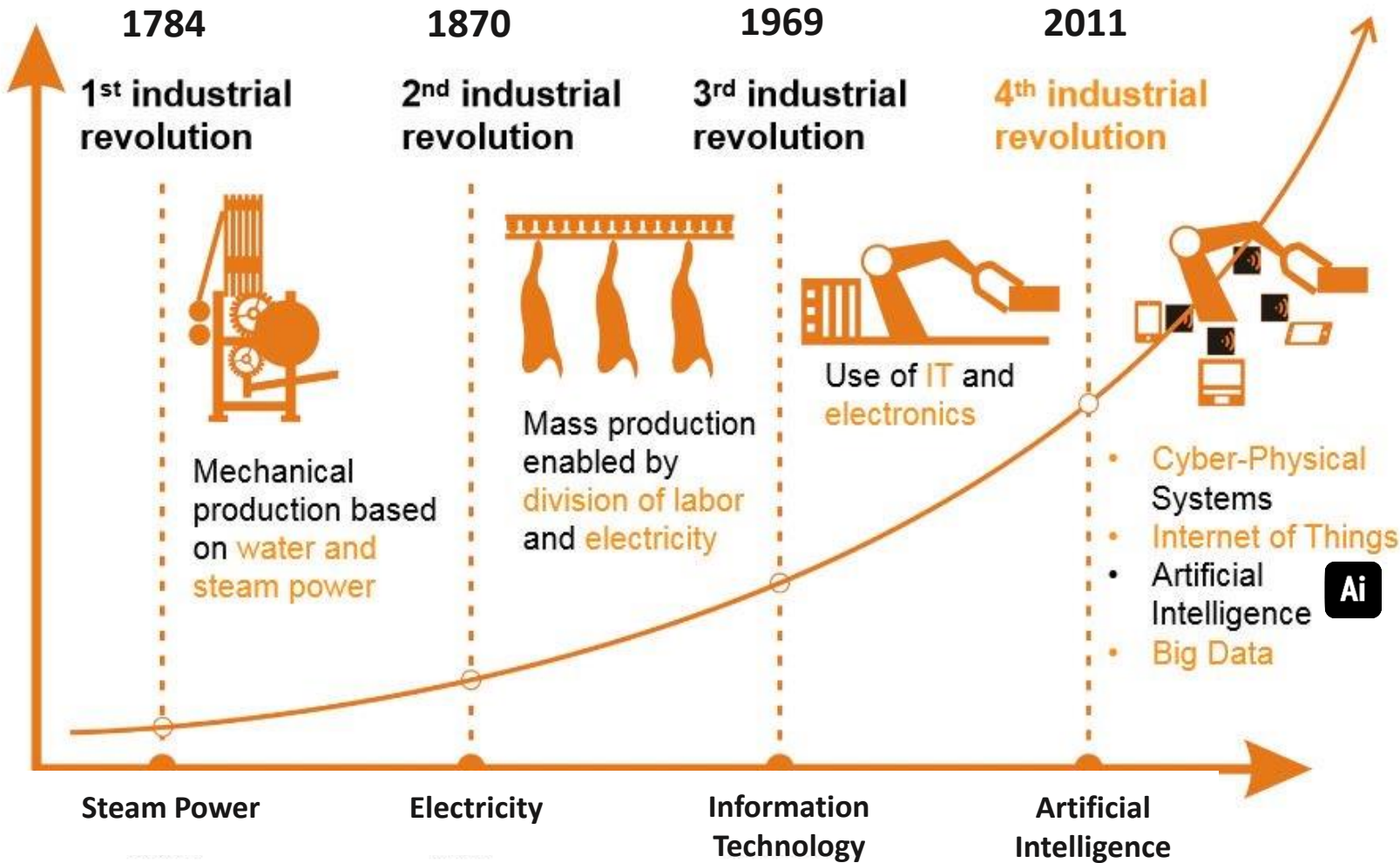
THE INDUSTRIAL REVOLUTION: We are entering 'Industry 4.0'



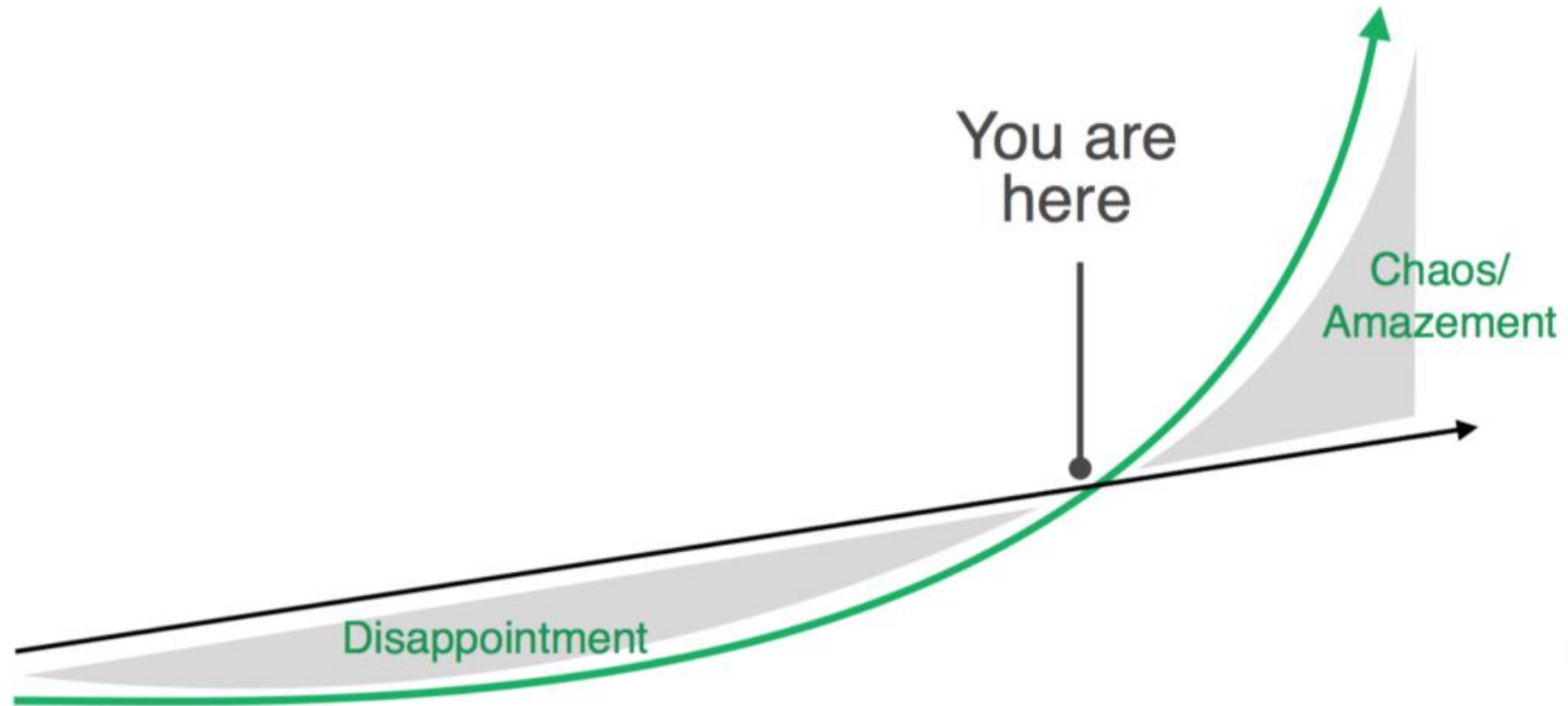
LOGICAL EVOLUTION

THE INDUSTRIAL REVOLUTION: We are entering 'Industry 4.0'

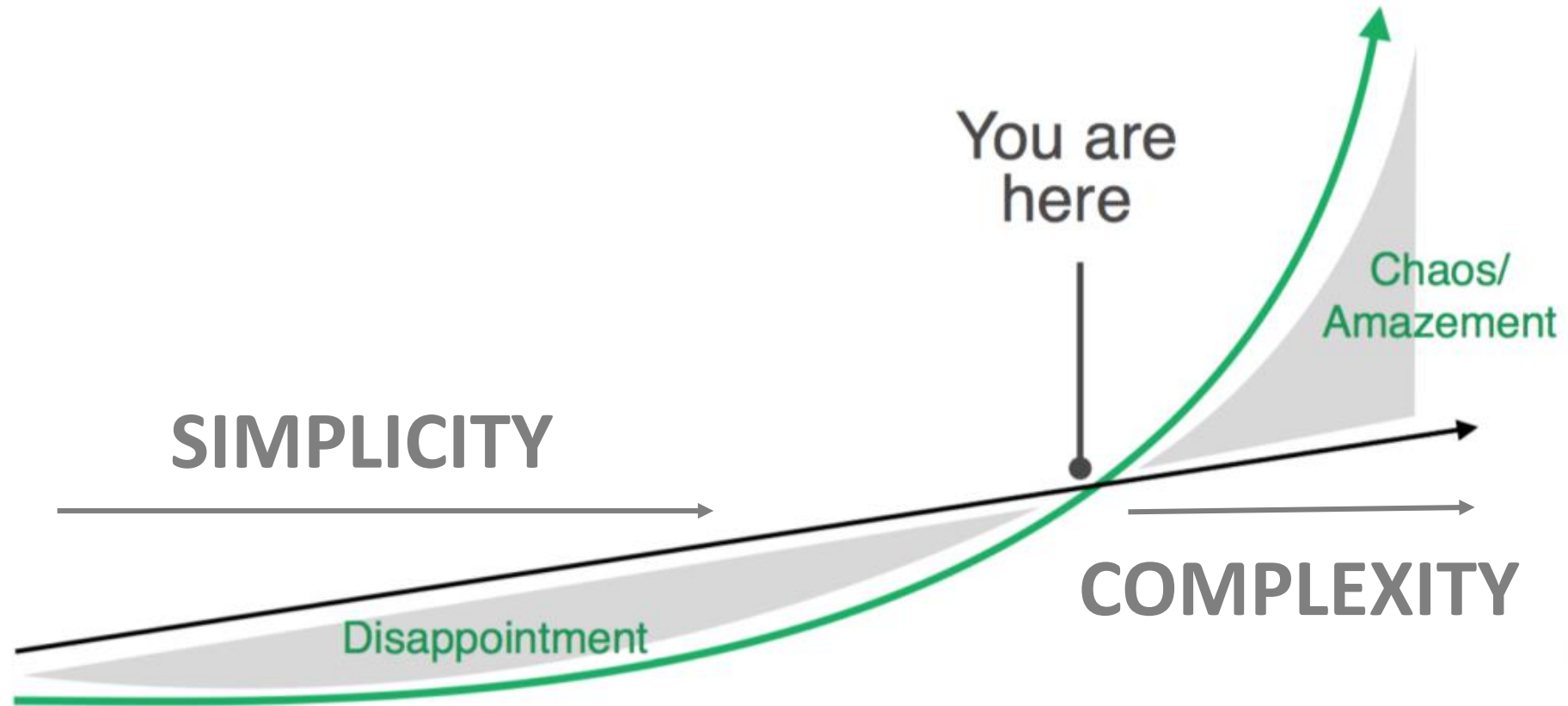
what's next



Linear vs Exponential Human Brain vs Technology



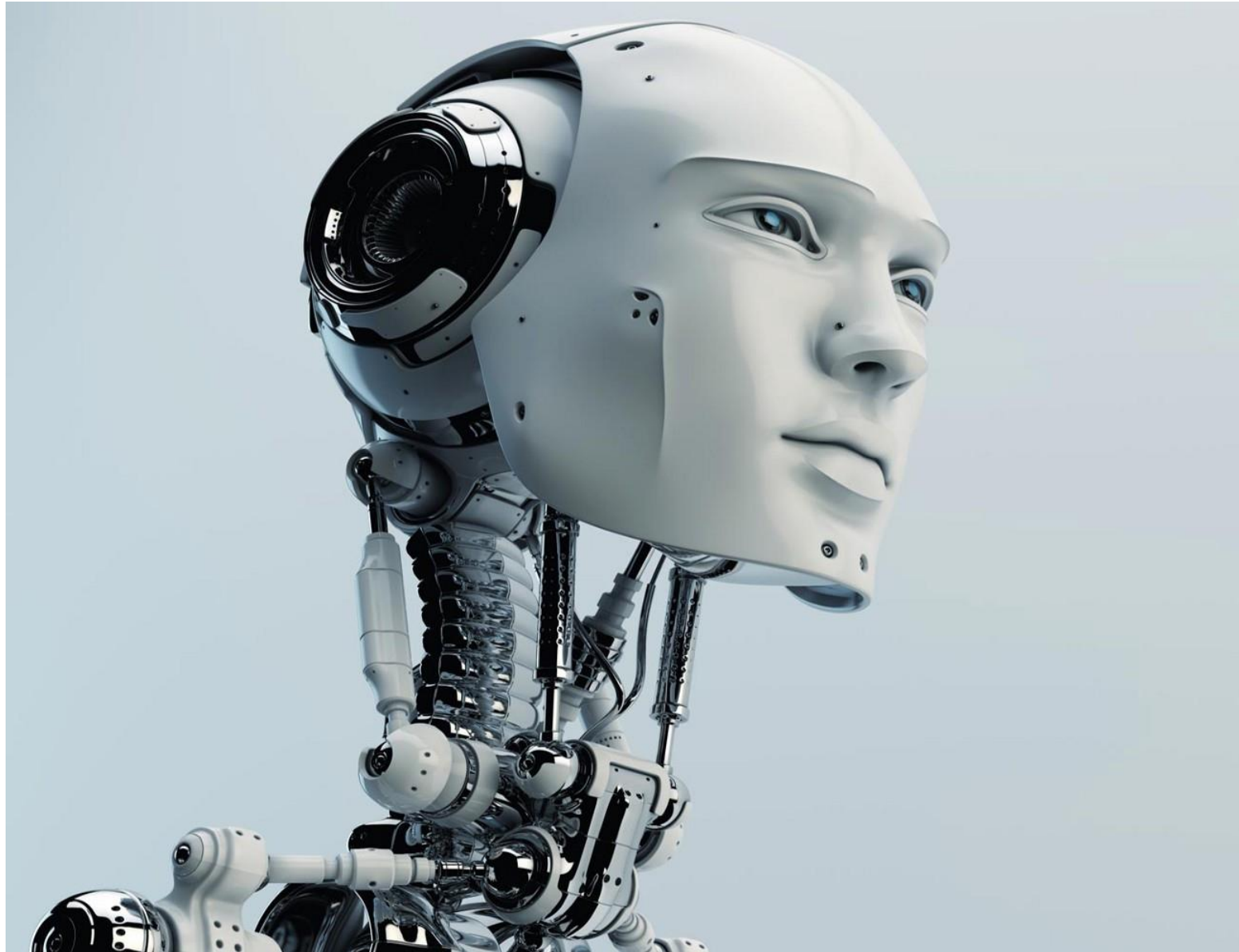
Linear vs Exponential Human Brain vs Technology



LOGICAL EVOLUTION

Complexity drivers:

- IoT
- Big data
- A.I.
- IFTTT
- Voice Control
- Brain Control
- Blockchain
- Implants
- Autonomous driving cars
- 3D printers
- Synthetic Biology
- Robotics
- Nanobots
- Quantum Computing



“Complexity is your enemy. Any fool can make something complicated. It is hard to make something **simple.**”



Richard Branson

4. CAPACITY

START OF CABLE INTERNET

1 October 1997: Launch Internet over Cable

01 - 10 - 97

MEDIA KORT: OKTOBER 1997

31 oktober 1997 Geschreven door Redactie Gepubliceerd in Nieuws kort Permalink

A2000 START INTERNET VIA DE KABEL

Met ingang van deze week kunnen abonnees van kabelexploitant A2000 het Internet op via de kabelaansluiting. Inwoners van Purmerend hebben de primeur, Zaanstad en Hilversum volgen binnen enkele maanden en in de tweede helft van 1999 zullen de laatste Amsterdammers via A2000 het Internet op kunnen. Een abonnement op Internet gaat bij de kabelexploitant f 89 per maand kosten (inclusief de huur van het kabelmodem). De aansluitkosten bedragen echter wel f 399 (installatie kabelmodem, aanleg coaxkabel en installatie software). De snelheid is enorm hoog. Een bestand van 12 MB is binnen anderhalve minuut binnengehaald.

<https://mediamagazine.nl/media-kort-oktober-1997/>

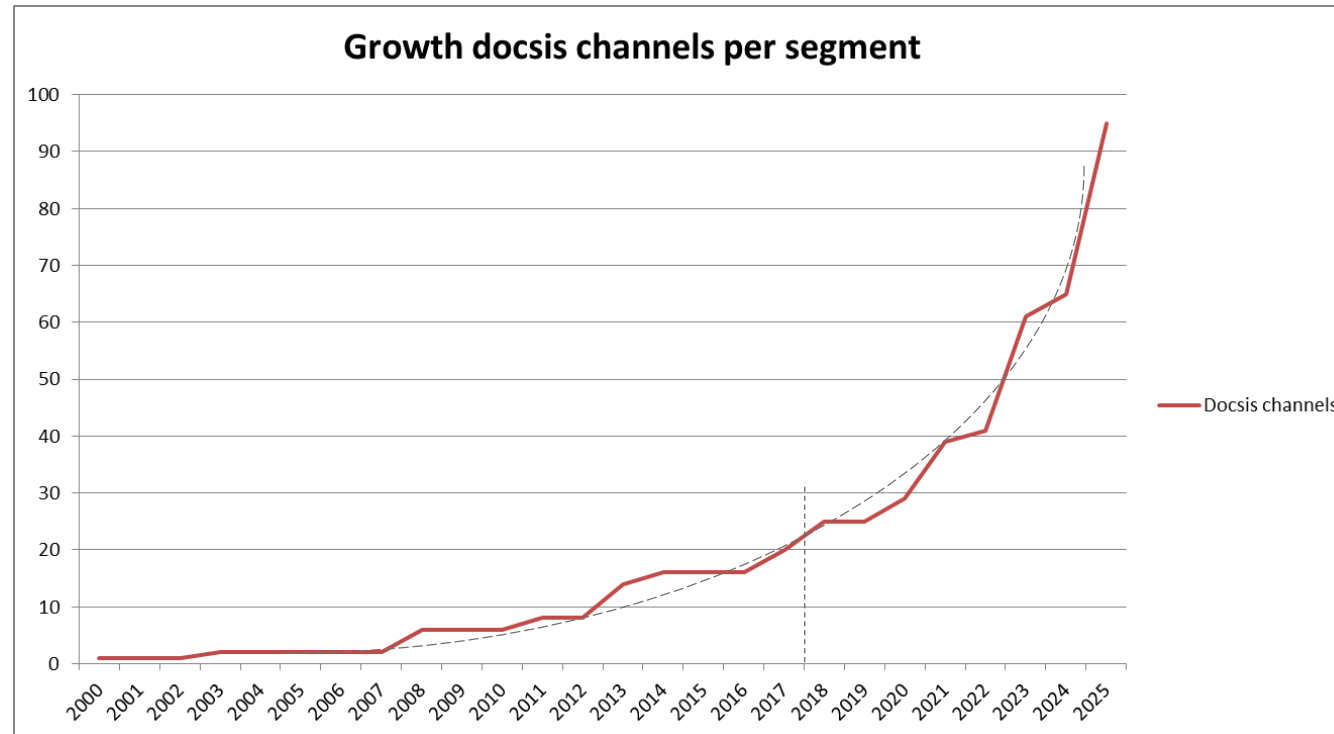
DATA GROWTH

Capacity planning based on:

- Trend analysis of historical data growth (25-30%)

Historic analysis per year 2000 shows a DOCSIS channel allocation of:

- 2000 1
- 2002 1
- 2004 2
- 2006 2
- 2008 6
- 2010 6
- 2012 8
- 2014 14
- 2016 16
- 2018 25
- 2020 39
- 2022 61
- 2024 95



- Within the next 5 years capacity will triple (from 25 to 75 carriers)
- For comparison reasons the 'traditional' 8 MHz slots for DOCSIS channels are used to show growth

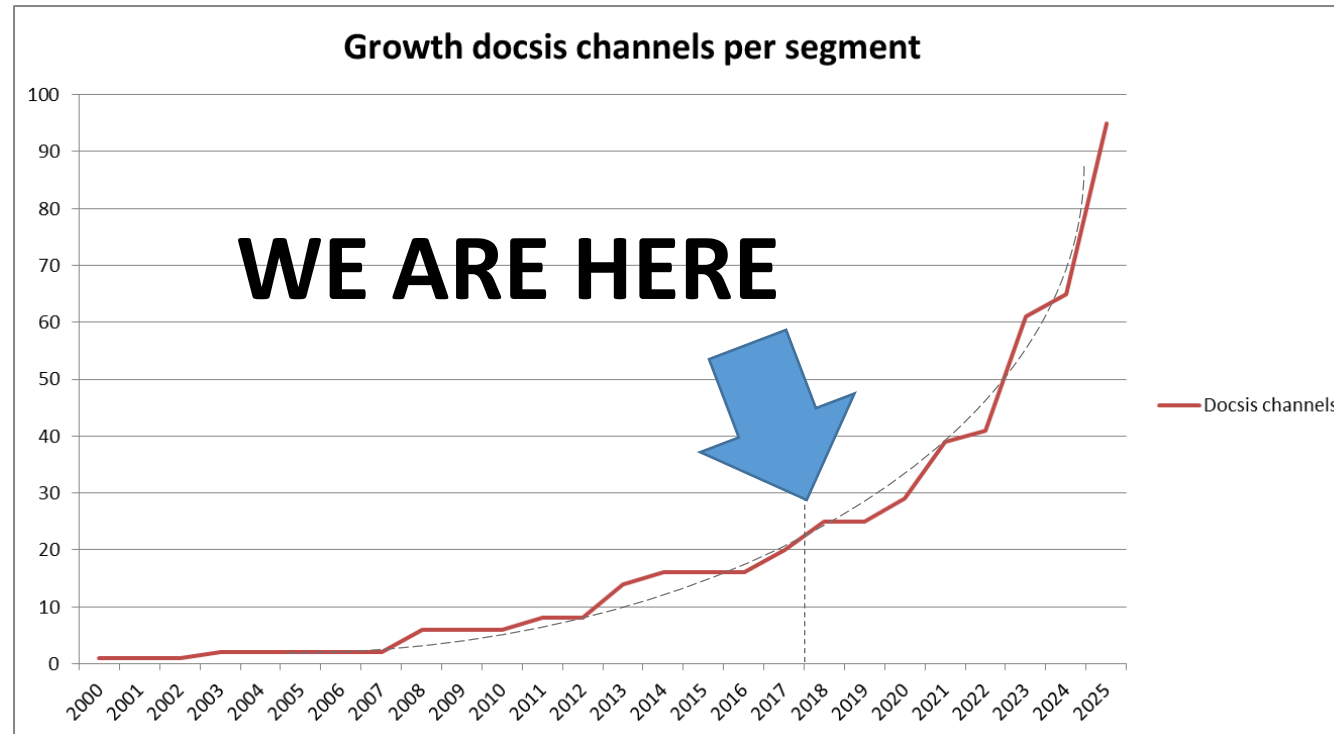
DATA GROWTH

Capacity planning based on:

- Trend analysis of historical data growth (25-30%)

Historic analysis per year 2000 shows a DOCSIS channel allocation of:

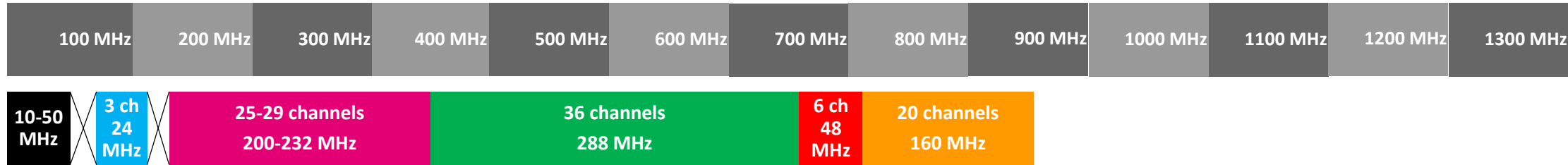
- 2000 1
- 2002 1
- 2004 2
- 2006 2
- 2008 6
- 2010 6
- 2012 8
- 2014 14
- 2016 16
- 2018 25
- 2020 39
- 2022 61
- 2024 95



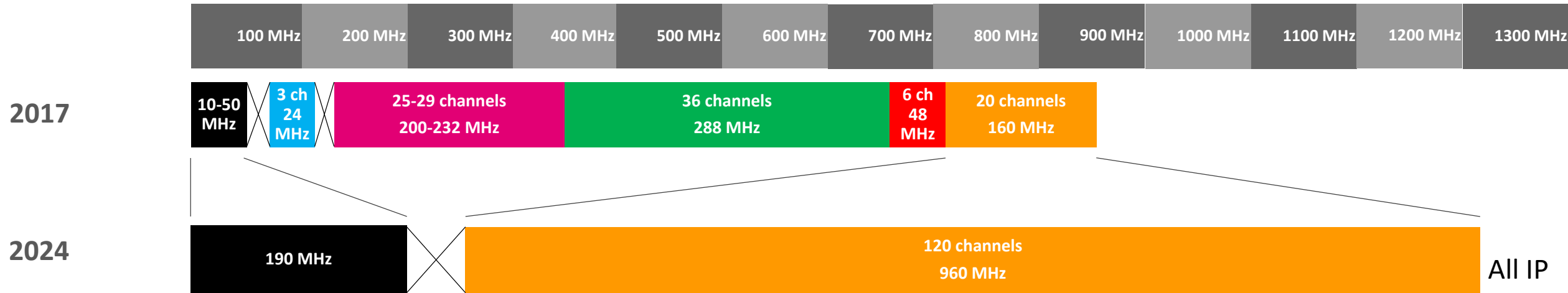
- Within the next 5 years capacity will triple (from 25 to 75 carriers)
- For comparison reasons the 'traditional' 8 MHz slots for DOCSIS channels are used to show growth

DATA GROWTH

2017



DATA GROWTH



Is this realistic?

DATA GROWTH

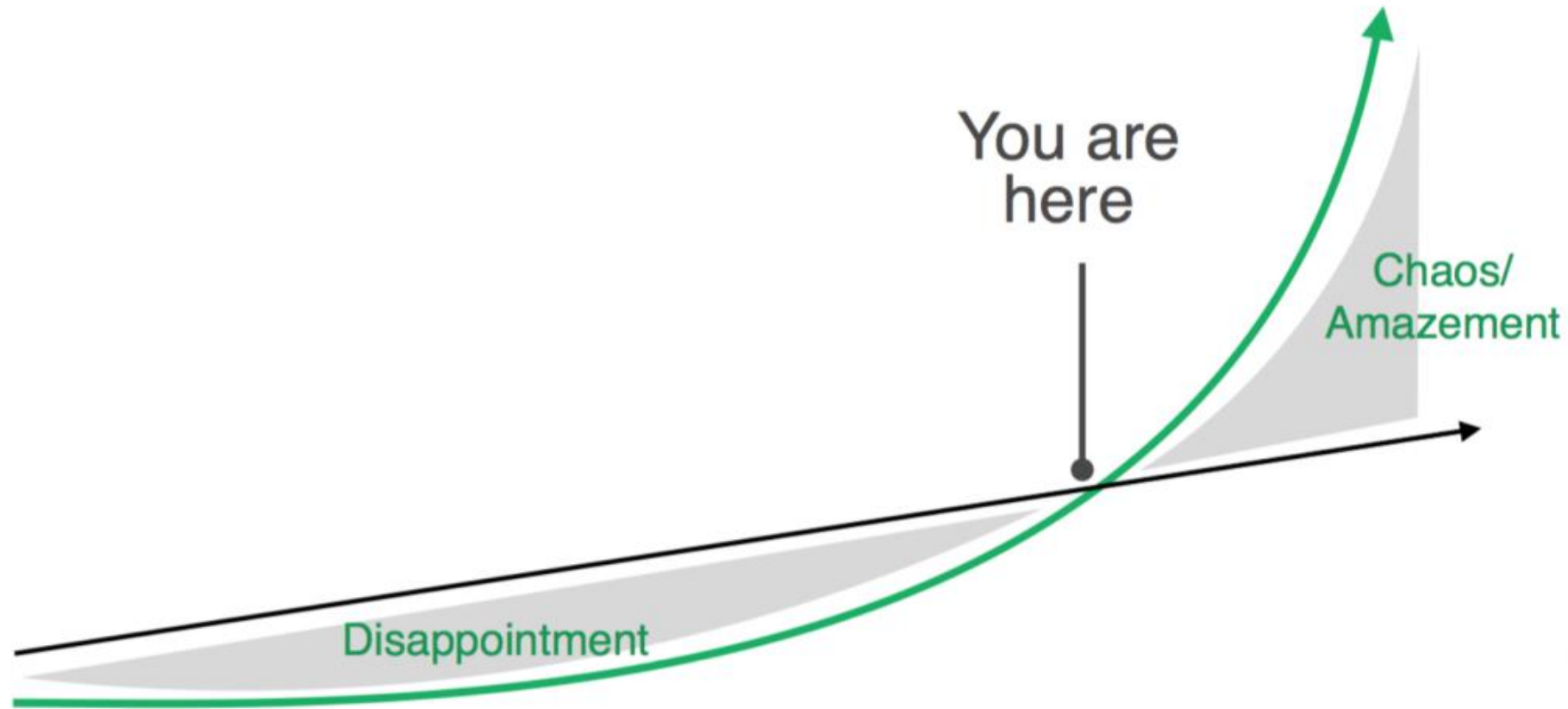
What possibilities are out there:

- Architecture: DAA – Remote PHY / EPON / GPON / Fiberdeep
- Equipment: CMTS DOCSIS 3.1 / uCMC
- Spectrum: > 862 MH > 1218 MHz

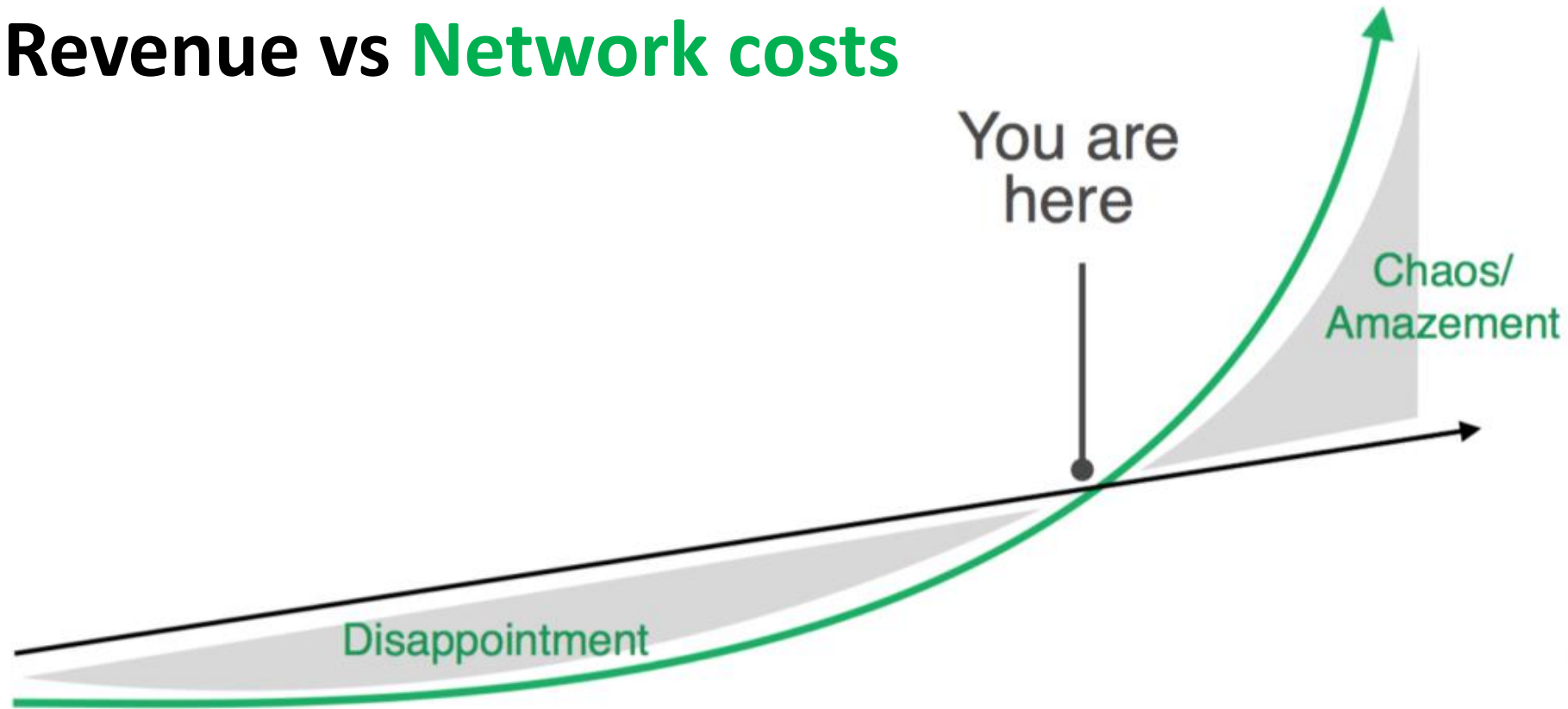
- Quantum Computing Google Bristlecone (72 qb) / Intel Tangle Lake (49 qb)
- Photonics Smaller equipment, less latency, less power consumption
- Neuromorphic networks Asynchronous communication with clock-free design

5. A DIFFERENT MODEL

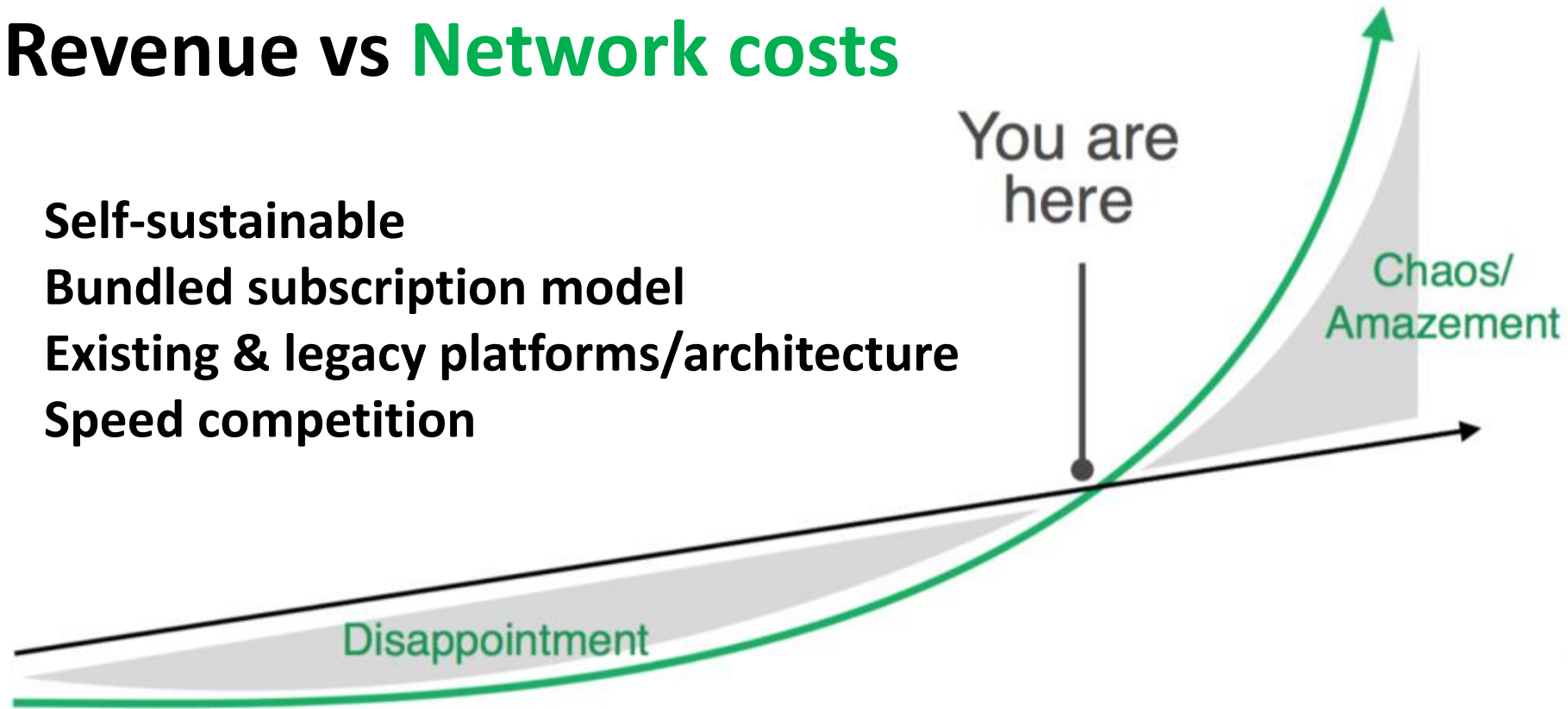
Linear vs Exponential Human Brain vs Technology



Linear vs Exponential Human Brain vs Technology Revenue vs Network costs



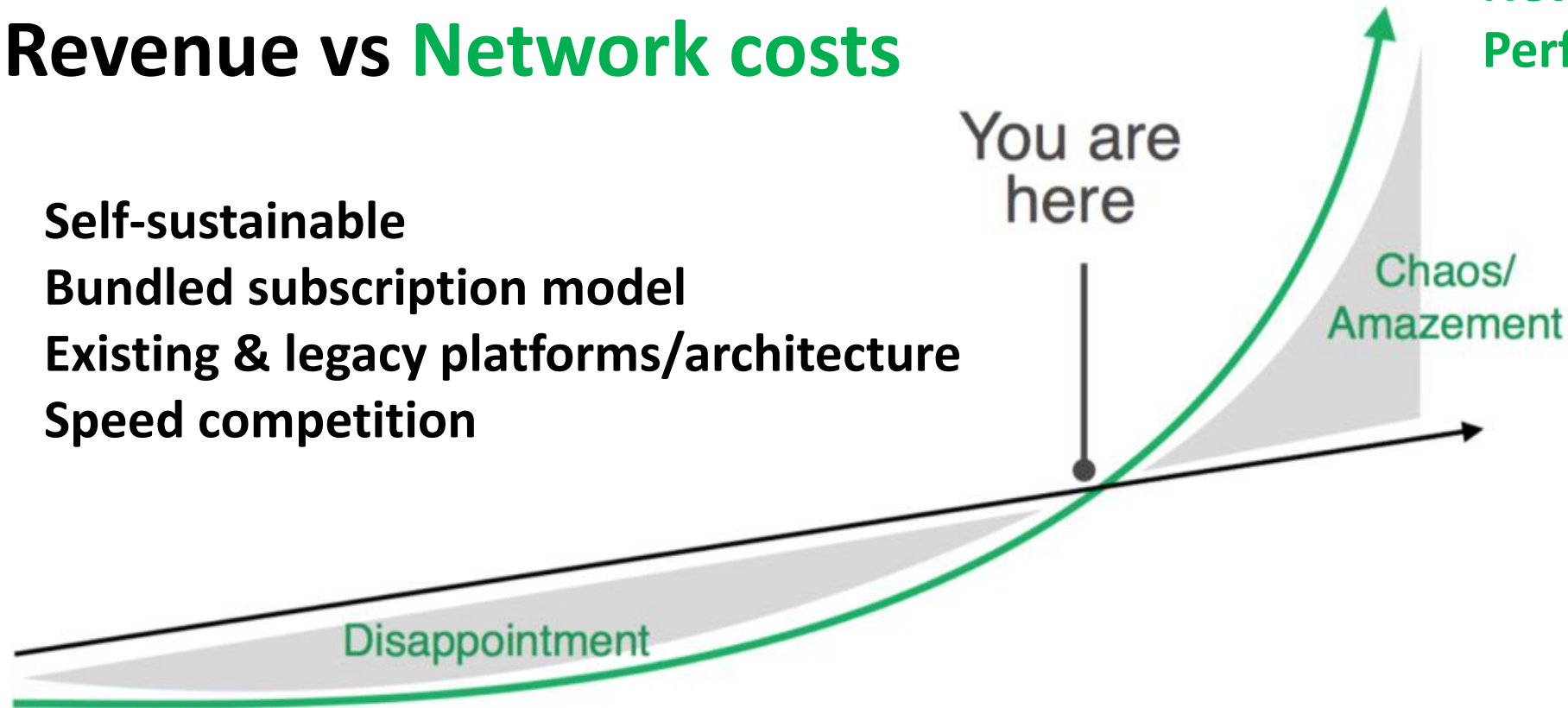
Linear vs Exponential Human Brain vs Technology Revenue vs Network costs



Self-sustainable
Bundled subscription model
Existing & legacy platforms/architecture
Speed competition

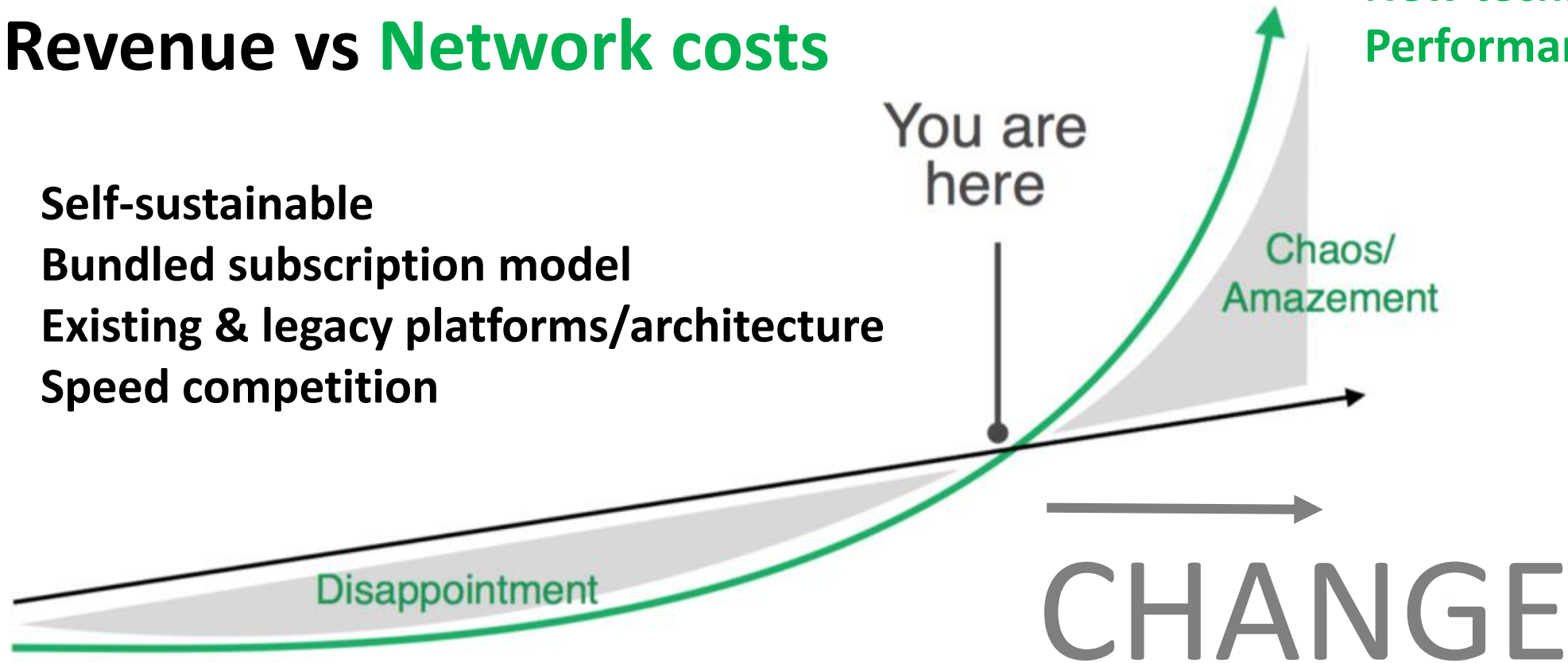
Linear vs Exponential Human Brain vs Technology Revenue vs Network costs

Partners
Pay per Usage / UNLTD
New technologies
Performance focused



Linear vs Exponential
Human Brain vs Technology
Revenue vs Network costs

Partners
Pay per Usage / UNLTD
New technologies
Performance focused



DIFFERENT MODEL SUMMARY



DIFFERENT MODEL

SUMMARY

Technology driven economy



DIFFERENT MODEL

SUMMARY

Technology driven economy

Exponential data growth



DIFFERENT MODEL

SUMMARY

Technology driven economy

Exponential data growth

Managing complexity



DIFFERENT MODEL

SUMMARY

Technology driven economy

Exponential data growth

Managing complexity

Leave traditional model



DIFFERENT MODEL

SUMMARY

Technology driven economy

Exponential data growth

Managing complexity

Leave traditional model

Think exponentially, Pay attention





**Get inspired,
Follow your intuition**

Thank You

Wilco Dekker
1 Mei 2018 Dutch Guild

