International Institute for Applied Systems Analysis
IIASA www.iiasa.ac.at

science for global insight

New technologies will transform the global markets - or will they?

The Youth Forum 2021

The Image of the Future we want: The Horizon - 2100

Leena Ilmola-Sheppard

Question

- How technology will change the structure of the global markets?
- What are the key uncertainties?
- Two examples:
  - Platform ecosystems
  - Energy transition

How to plan the the different domains of the probability distribution

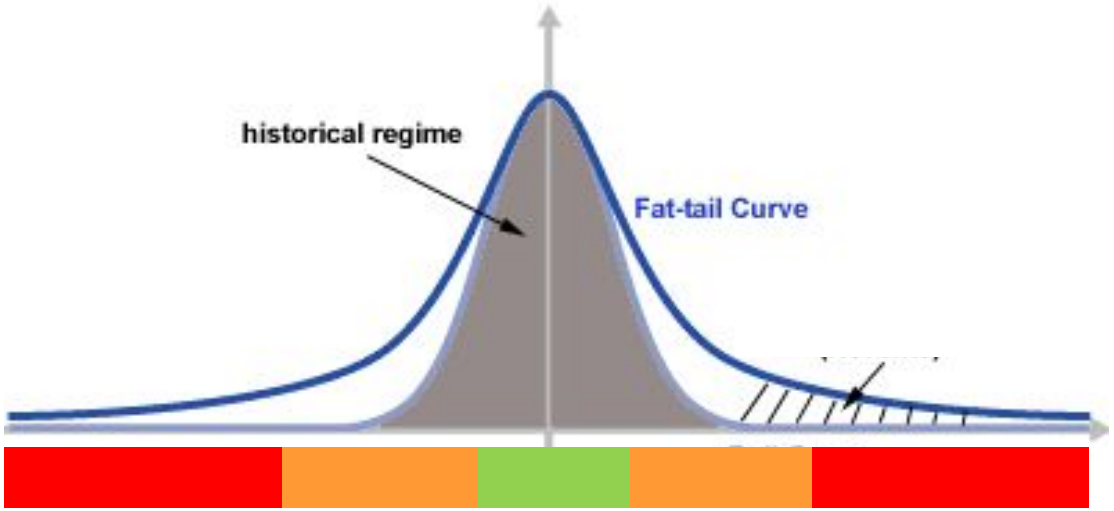
The Economist

THE ECONOMIC toll of the covid-19 pandemic is incalculable. But let's try anyway. A useful starting point is the semi-annual *Global Economic Prospects* report released this week by the World Bank. It calculates that the world economy probably shrank by 4.3% in 2020, a setback matched only by the Depression and the two world wars. But this dramatic figure still understates the cost. It measures the world economy's fall from where it was before the pandemic, not from where it would have been had the virus not spread.

Jan 2020

To calculate that bigger fall, economists need an estimate of how global GDP might have evolved in the absence of covid-19. One simple baseline is the World Bank's projection released this time last year, when it was still blissfully unaware of the lurking viral threat. Back then, it expected global GDP to expand by 2.5% in 2020 to $86trn. Compared with that figure, the shortfall of global GDP last year was probably more like 6.6%. That is equivalent to about $5.6trn (at the market exchange rates and prices prevailing in 2010, which the bank uses for analytical convenience).

- Xevents

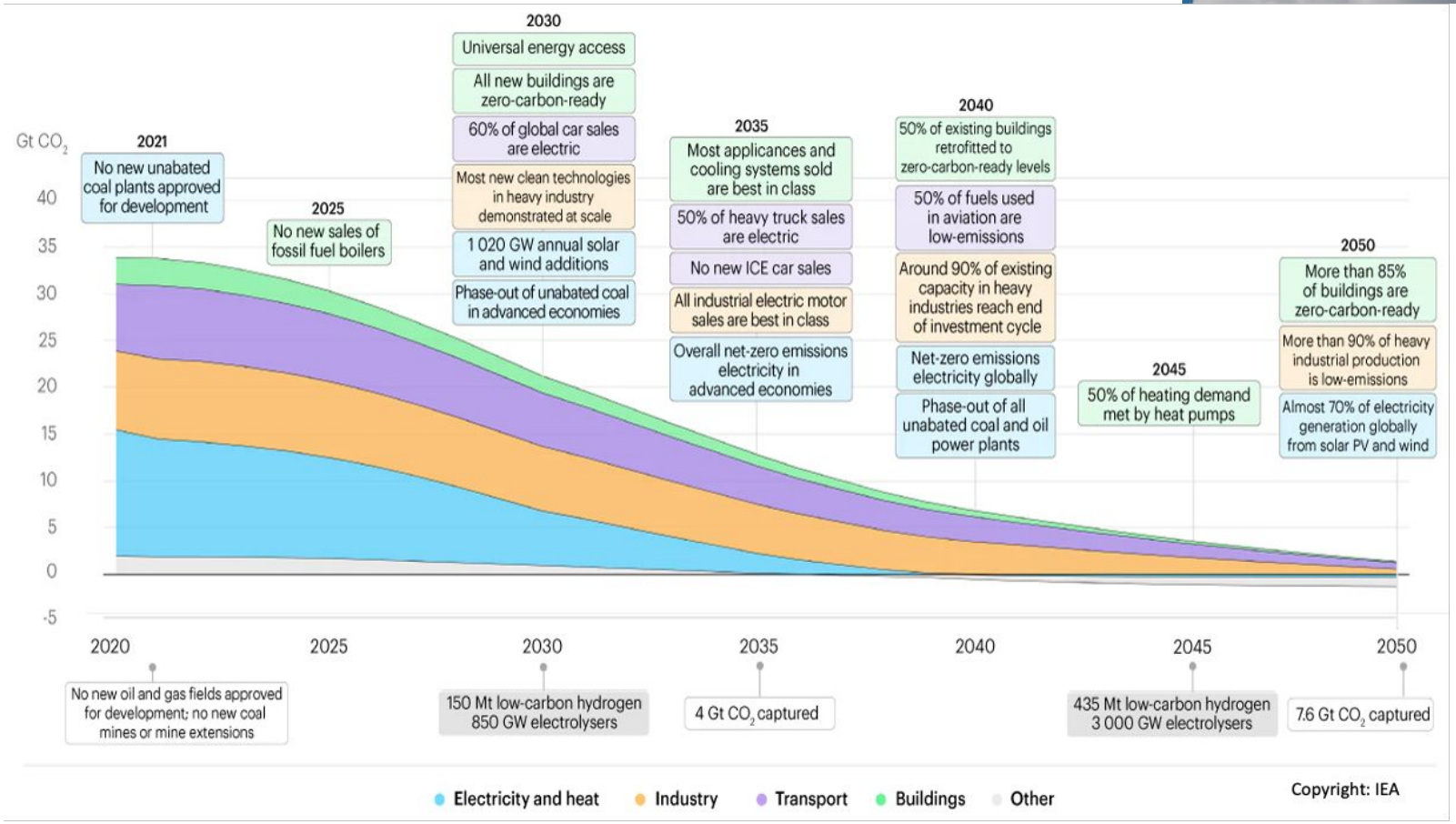


Strategic planning
Risk management
Resilience building

ENERGY TRANSITION

IEA May 2021


Net Zero by 2050
A Roadmap for the Global Energy Sector
International Energy Agency


Gt CO_2
40
35
30
25
20
15
10
5
0
-5
2021
No new unabated coal plants approved for development
2025
No new sales of fossil fuel boilers
2030
Universal energy access
All new buildings are zero-carbon-ready
60% of global car sales are electric
Most new clean technologies in heavy industry demonstrated at scale
1 020 GW annual solar and wind additions
Phase-out of unabated coal in advanced economies
2035
Most applicances and cooling systems sold are best in class
50% of heavy truck sales are electric
No new ICE car sales
All industrial electric motor sales are best in class
Overall net-zero emissions electricity in advanced economies
2040
50% of existing buildings retrofitted to zero-carbon-ready levels
50% of fuels used in aviation are low-emissions
Around 90% of existing capacity in heavy industries reach end of investment cycle
Net-zero emissions electricity globally
Phase-out of all unabated coal and oil power plants
2045
50% of heating demand met by heat pumps
2050
More than 85% of buildings are zero-carbon-ready
More than 90% of heavy industrial production is low-emissions
Almost 70% of electricity generation globally from solar PV and wind
2020
2025
2030
2035
2040
2045
2050
No new oil and gas fields approved for development; no new coal mines or mine extensions
150 Mt low-carbon hydrogen
850 GW electrolysers
4 Gt CO_2 captured
435 Mt low-carbon hydrogen
3 000 GW electrolysers
7.6 Gt CO_2 captured
Electricity and heat
Industry
Transport
Buildings
Other
Copyright: IEA

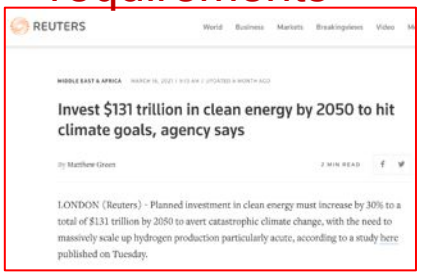
Energy Transition: Uncertainties….

Coal rich countries

	Country	Coal reserves (t, 2016)	Share %
1	United States	254,197,000,000	22.3%
2	Russia	176,770,840,800	15.5%
3	Australia	159,634,329,600	14.0%
4	China	149,818,259,000	13.1%
5	India	107,726,551,700	9.5%
6	Germany	39,802,209,480	3.5%
7	Ukraine	37,891,906,250	3.3%
			3.1%
			2.5%
			2.5%
			2.2%
			1.1%

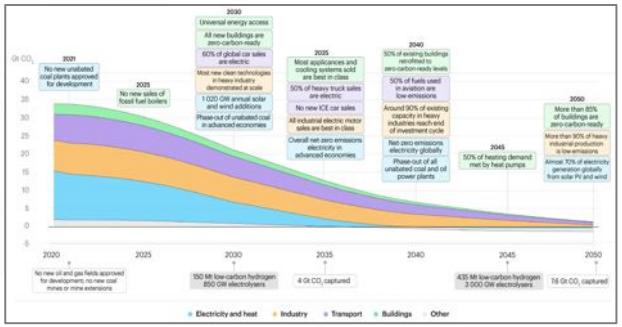
'Oil producing countries will lose 75% of their income per capita!'

Huge investment requirements


REUTERS

Invest $131 trillion in clean energy by 2050 to hit climate goals, agency says

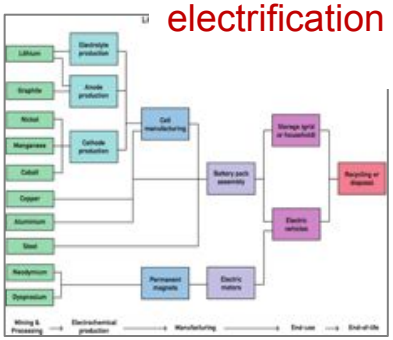
LONDON (Reuters) - Planned investment in clean energy must increase by 30% to a total of $131 trillion by 2050 to avert catastrophic climate change, with the need to massively scale up hydrogen production particularly acute, according to a study here published on Tuesday.




Services News Government Local

Governor Cuomo Announces Plug Power to Invest $290 Million in New Hydrogen Fuel Production Facility and Electric Substation in Genesee County

Limits of electrification



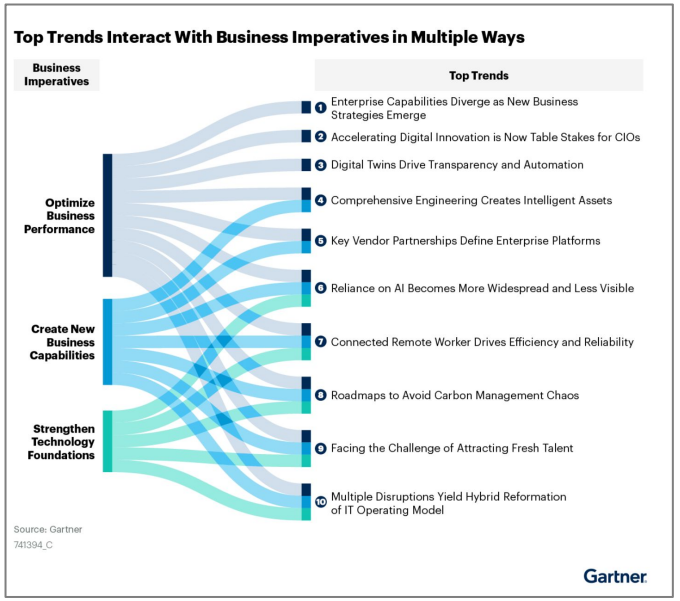
China: 50% of renewable energy investments

Energy Transition: Examples of Enablers

- Crowdfunding of local micro-grids or off-grid solutions, community ownership models
- The smart grid software market reach a market size of US$23.180 billion by the year 2026. *)
- Distributed energy resources (DERs) &
- The Gartner reports in May 21** that the oil and gas companies are developing new business models, that digitally integrate different forms of energy
- By applying AI enhanced digitalization of their downstream plant operations, BP had been able to improve efficiency by 8-12% (Forbes Nov 16, 2020)

New businesses of utilization of carbon emissions - DAC technology

Energy is a public good?



**)
https://emtemp.gcom.cloud/ngw/globalassets/en/information-technology/documents/trends/741394-top-10-trends-driving-the-oil-and-gas-industry-in-2021.pdf

*)
https://www.researchandmarkets.com/reports/5317971/smart-grid-software-market-forecasts-from-2021

DIGITAL ECOSYSTEMS

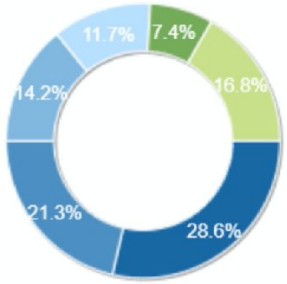
global-internet-map-2018.webp

How digitalization will change the structure of the global markets 1

https://www.idc.com/tracker/showproductinfo.jsp?containerId=IDC_P29475

IDC
ANALYZE THE FUTURE

Top Technology Category Based on 2020 Market Share (Value (Constant Annual))



Trend Highlight

A key trend com
independence. I
digital-first mod
services. IoT edg
consumer and i
get there.

Module/Sensor
Ongoing Service or Content as ...
IT and Installation Services
Application Software
Other Connectivity
Others

Source: IDC Worldwide Internet of Things Spending Guide 2020 | May (V1 2020)

AUGUST 17, 2021 BY ADMIN

Rise in IoT And Machine Learning Is Driving Industry 4.0 Market

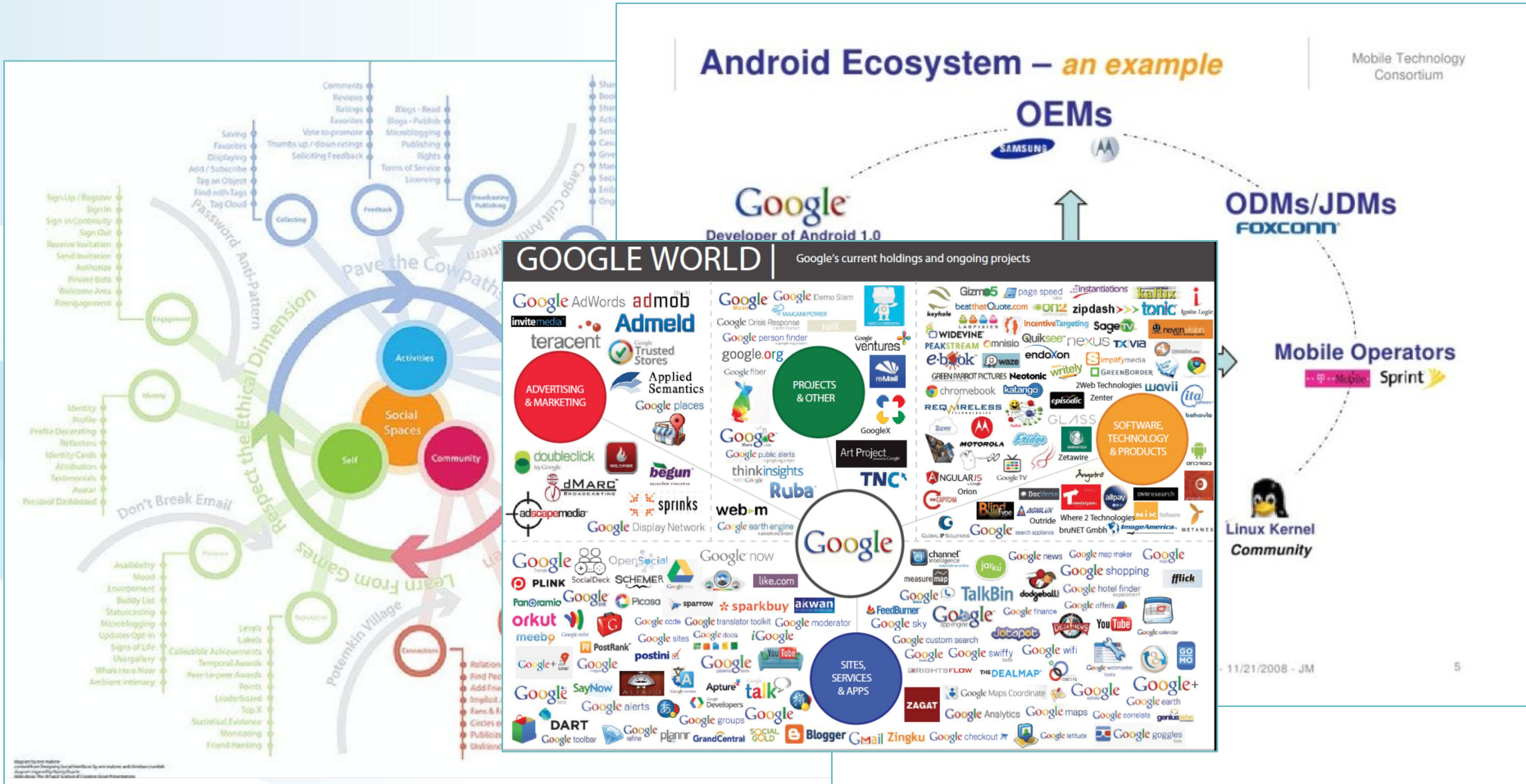
"Industry 4.0 Market"

Rapid adoption of Internet of Things and Machine Learning in the steady shift towards robotics and industrial automation are some key factors fueling market revenue growth

Industry 4.0, also refer to as fourth industrial revolution that focuses on deep learning, automation, machine learning (ML), Artificial Intelligence (AI), edge computing, digital twin and data analytics. Industry 4.0 revolutionize the way business operates by offering access to real-time insights across products, processes, partners, and people. It connects physical with digital for better control of business operations.

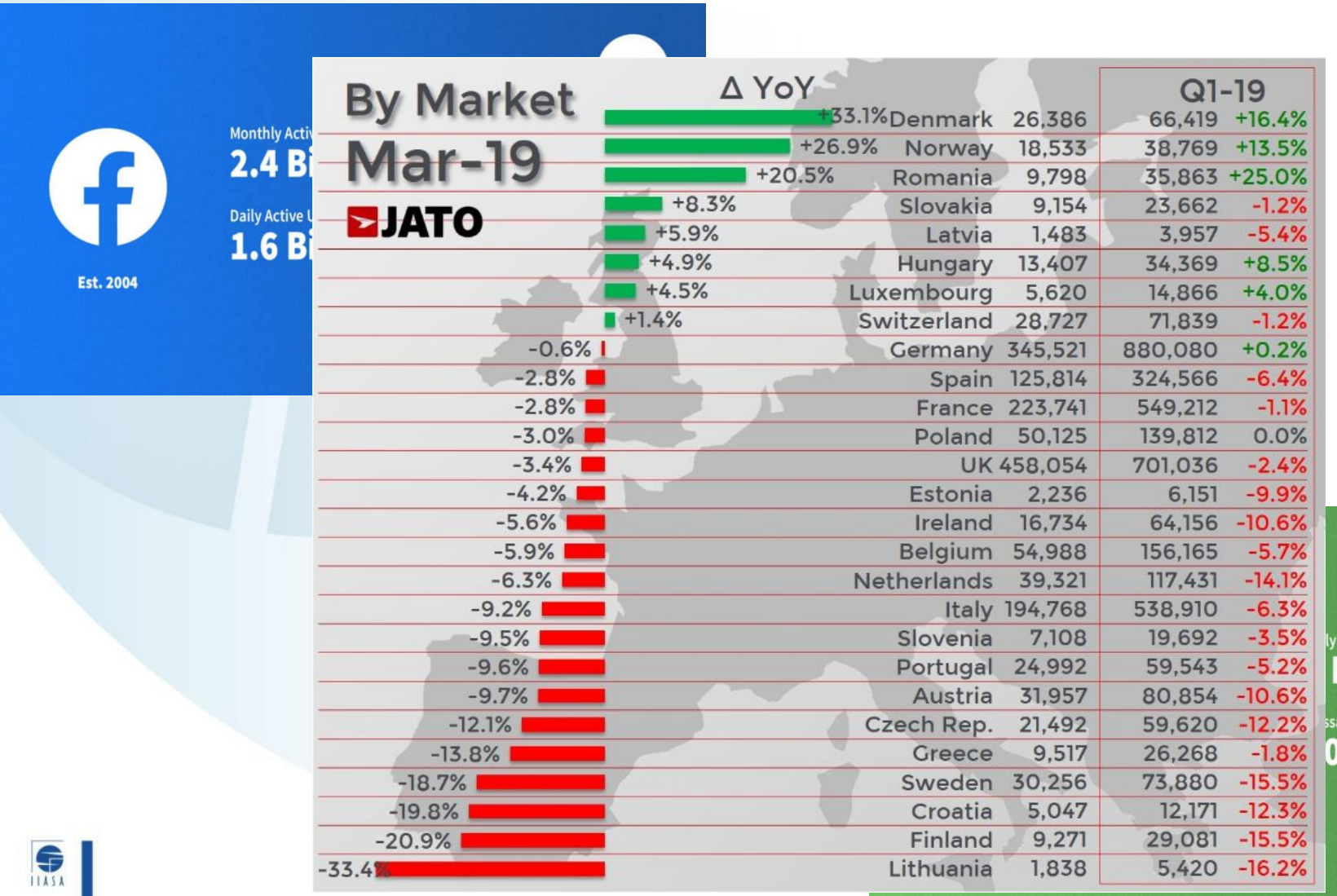
The global industry 4.0 market is expected to register fastest revenue growth rate over the forecast period due to rapid adoption of Internet of Things (IoT), cloud computing and analytics into production facilities. The increasing demand for industrial robotics in manufacturing units to reduce production costs is resulting in the advent of additional opportunities for further

How digitalization will change the structure of the global markets 2



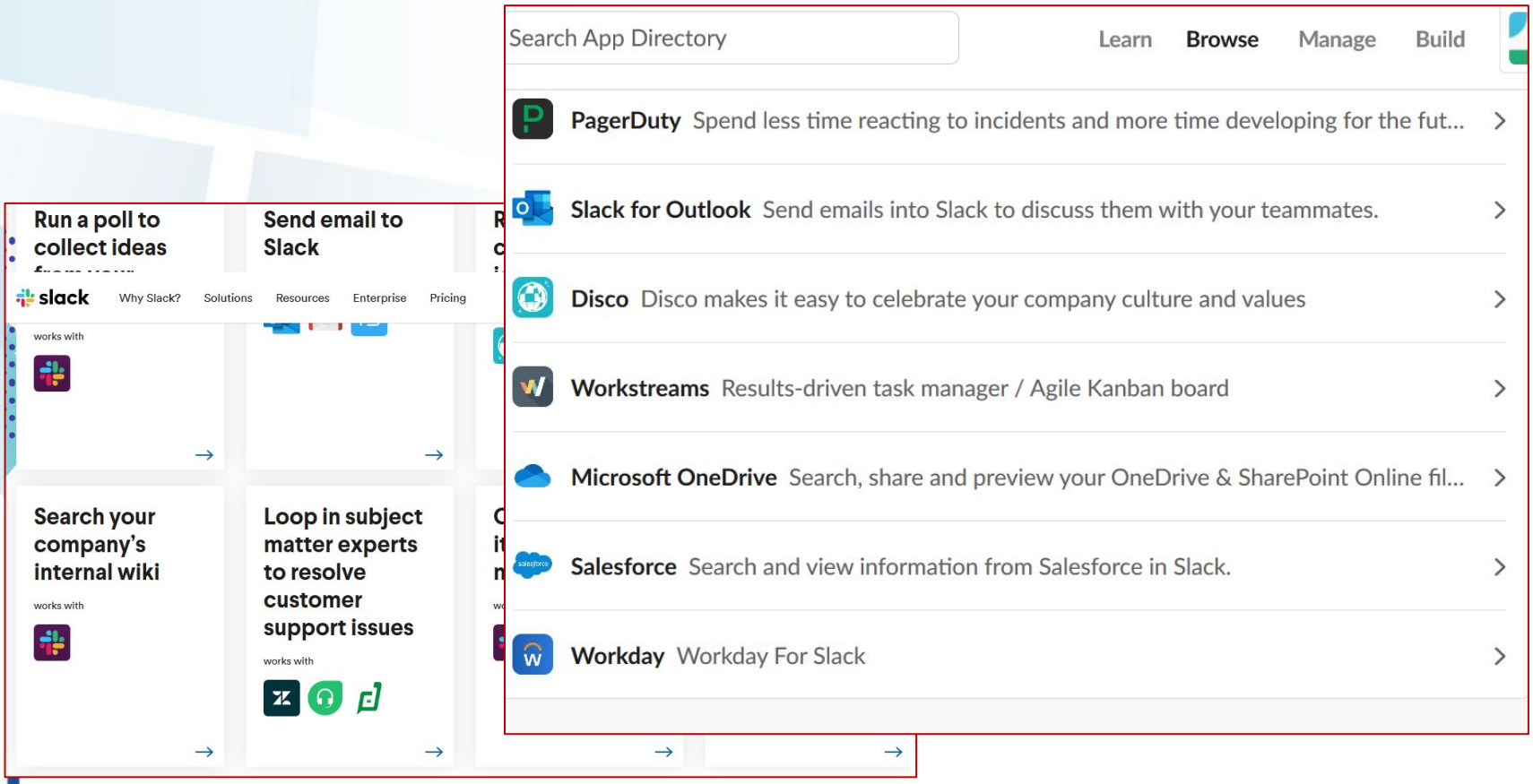
https://churchm.ag/android-apple-ecosystems/

How digitalization will change the structure of the global markets 3



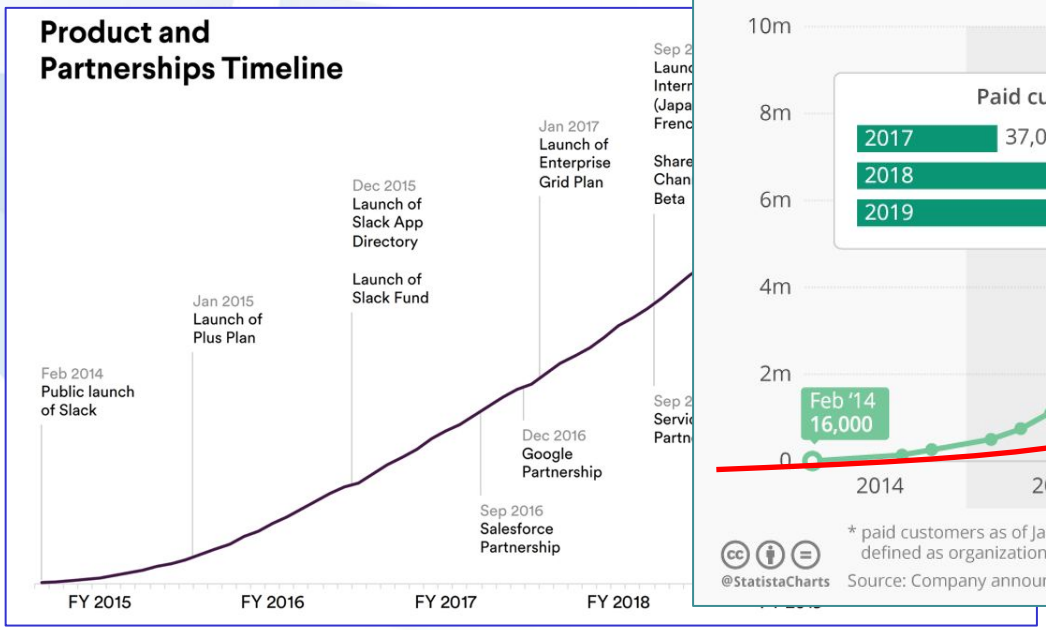
Open platform ecosystems and resilience

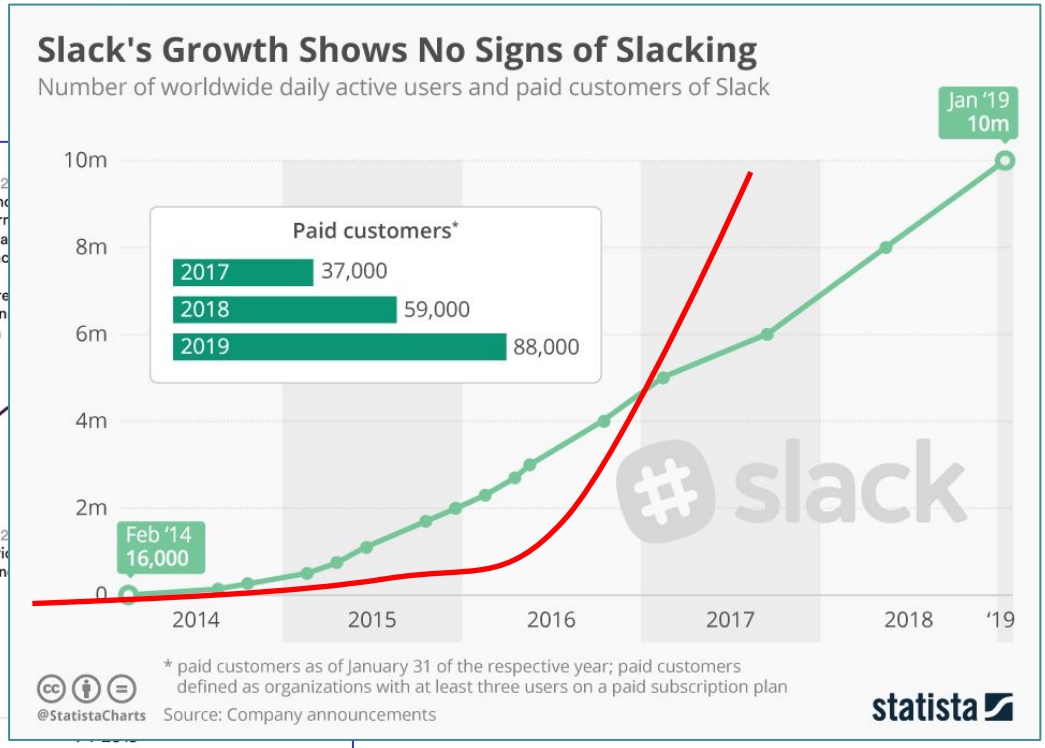
- …from Complex Adaptive Systems perspective
- Uncertainties such as user behavior, technology, institutional environment



Open platform ecosystem

- No centralized control, anyone can join
- Network externalities grow exponentially ; fast growth,
- Integrated innovation





Adaptation..

- Open platform ecosystems are complex
  - Law of requisite variety > same level of complexity, complexity mismatch
- Interaction is defining what is happening next
  - self-organization of structure and output
- Automatic feedback loops

Questions?

Please contact
ilmola@iiasa.ac.at