datacenter forum

Data centers: finding a balance between enabling the digital economy and securing critical infrastructure

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This Presentation is Based on Recent History

… I hear again and again

while working with Data Centre

Foreign Direct Investors (FDI) in conversations with Government agencies …

“How many Jobs will be created…?”

In a Digital Economy & Digital Age
a more pertinent question is

“what economic impact will this investment bring to the wider economy…?”

A Revolution - Digital Economies

When I went to school…

I went with books and access to a Library

My children went to school…

with a laptop and the internet (www)

That is a Revolution

Digital Lifetime

‘less than a life time’ timeline:

- Fibre Optic’s invented in 1952
- Microsoft founded in 1975
- TCP/IP adopted 1983
- World-Wide-Web (www) invented in 1989
- Yahoo.com in 1995 (first wave WebGiant)
- 16% of global population had internet in 2005.

  2021 circa 60%

13 largest economies = 70%

global GDP.

The Internet is BIGGER than

Mining, Utilities, Agriculture,

Communication, Education,

Transportation.

Source: Economic intelligence Unit.

If the internet was a nation

World’s 5th largest

Digital Lifetime

- World' s First WWW Internet browser - Erwise: 1992
- World' s First GSM call: Helsinki University of Technology in 1991
- 1st Satellite Call: 1994 where performed on a Nokia phone!
- World Wide Web on Linux: Open-source software. Inventor Linus Torvalds
- World' s First SMS (Texting): Pioneered by Matti Makkonen, Nokia and Telecom Finland
- World's first Internet relay chat: IRC protocol - 1988 University of Oulu

Digital Economy – inc. all of ICT

Digital Economy ***$11.5+ trillion,** or **15.5 %** of global GDP
18.4 % GDP developed economies. 10% developing economies ave (2016!)

Digital Economy had grown 2.5x faster than global GDP, almost doubling in size since 2004-2017.

Most of the value was produced in only a few economies:

- United States 35%
- China *13% (circa 20%?) and Japan *8%.
- EU+EEA circa 25%
    - UK #3, Germany #4, France #5, Sweden #14

Digital Investment Class

34% of Investors questioned in the ‘2018 EY Attractiveness Survey Europe’ show The Digital Economy as the leading investment class.

2 Nation States - Digital Economy

50% of the World's

Hyperscale

Data Centres

Highest rates of

5G

Global Adoption

94% of all

Funding of

AI

Start-ups

90% Market Capitalization

of the world's largest digital platforms

Projected Growth: Digital Economy Global GDP

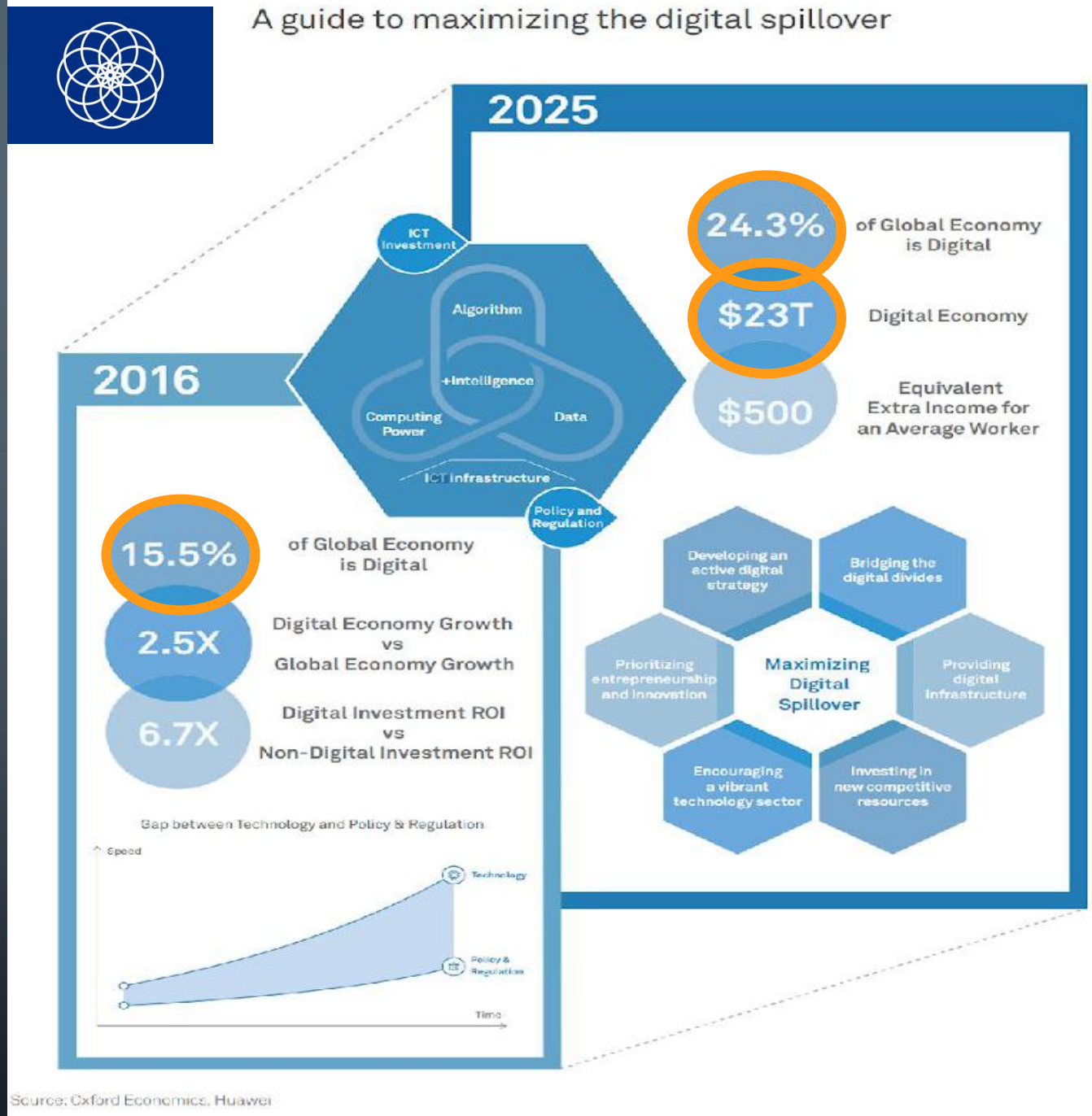
GDP Growth to 2025:

up to 24.3% or $23 trillion

Needed: ICT Investments

Inc. Networks

Data Centers



ICT at the Core of the Green Agenda

Green Capacity of Change

Anthropogenic climate change evidence is overwhelming.

ICT, data centres and digital infrastructure a solid platform to drive carbon reduction while showing investment opportunities - part of a sustainable solution!

WORLD ECONOMIC FORUM

ICT global: 2.3% emissions the sector can drive a 10x multiple (circa 20% Global) carbon reduction by 2030

At a macro level, large ICT implementations have a few years lag before

ICT at the Core of the Green Agenda

GeSI
GLOBAL e-SUSTAINABILITY INITIATIVE

GeSI states **ICT can reduce greenhouse gas emissions** (GHG) by **20%** versus a 'no change' approach by 2030 (equivalent emissions to 2015), providing ***$11tn in new economic and social benefits … e.g.** estimated 30% increase in agriculture yields for less water.

GeSI: Artificial Intelligence (AI) will reduce GHG by 4% in 2030 — the combined emissions of Australia, Canada and Japan. (Google uses AI to reduce data centre energy by 15%, inc. 6% reduction in cooling.)

GeSI: Digital technologies can dramatically reduce carbon dioxide emissions and global warming potential. Future, prediction, transformative reductions due to digitalisation.

Impact on CO2 emissions (tonnes):

E-commerce: -1bn

Virtual meetings and remote working: -0.5bn

Smart Grid: -2bn

Smart motors: -0.97

Smart buildings: -1.7bn

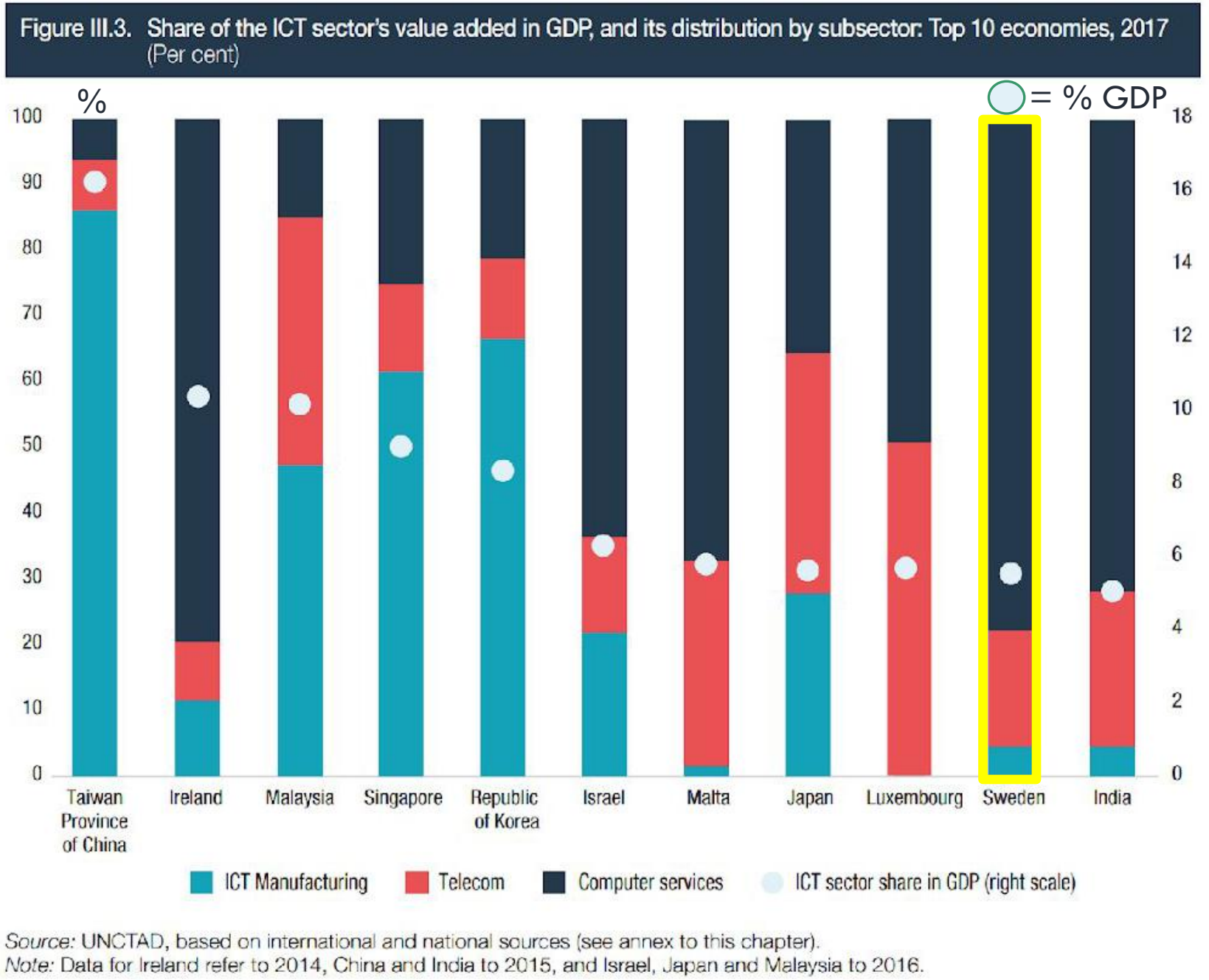
Transportation: -1.52bn

Some reports show approx. 10-12% for Nordic nations and the UK

National examples:

= % of GDP

Economic impact



Source: UNCTAD, based on international and national sources (see annex to this chapter).
Note: Data for Ireland refer to 2014, China and India to 2015, and Israel, Japan and Malaysia to 2016.

National examples: Data Centre economic impact

$36bn ‘National Broadband Strategy’ investment, 2010, contributed €170.9bn to GDP (0.60 % GDP growth).

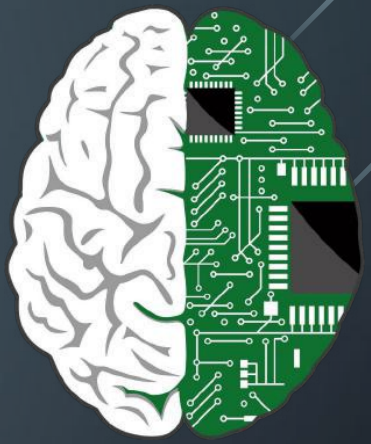
Dutch Central Bureau of Statistics, multi-tenant (Colo) data centres (excluding telecoms) contributed €462m to its economy. Total GDP impact estimated at €1bn = 7.7% of Netherlands’ GDP.

Oxford Research estimates the economic impact of the Finnish data centre cluster to be €7-11 bn (in a country with a population of only 5.5 million).

UK GDP ICT = 8.3% 2012. ICT UK GDP = 12.4% GDP 2016. ICT UK GDP = 7.7% GDP 2018.

McKinsey: **Internet contributed 23% to GDP** growth from Financial Crisis 2008 to 2013.

Since Birth of the WWW



$ invested in digital technologies = X20 to GDP average.
6.7 X higher than non-digital investments. idem 2018

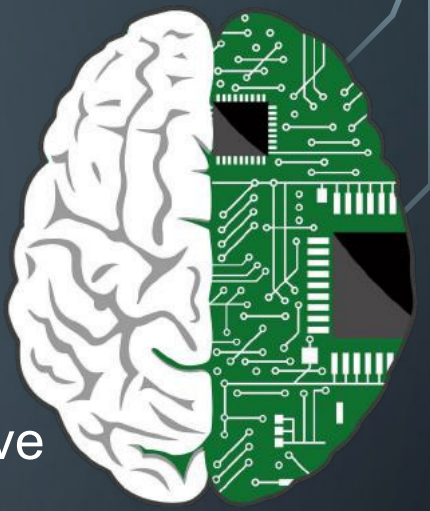
National examples: Broadband economic impact

" Internet penetration has a positive impact on economic growth".
(Myongji University South Korea after examining 207 countries)

"A clear path can be found from introducing broadband and its increased penetration to per capita GDP". (University of Munich 2009)

Every 10% increase in broad band penetration adds 0.9 to 1.5% to per capita GDP growth. (World Bank)

Return on Investments (ROI)



USA: Levin - **National Broadband Plan** to Generate **1,000% ROI**

"We spent **$20 million on the plan** and Congress [says] the incentive auction is worth **$22 billion**," said Levin. "… 1,000% ROI Goldman on the Facebook IPO." … (2012)

UK: Cost-benefit-ratio comparison: 20X

UK Rail investment = £2 benefit for £1 spent

UK broadband investment = £20 of benefit for £1 spent.

Malaysia: Broadband Cost-benefit-ratio:

Invest MYR 2.4 billion ($800 m).

GDP Impact = +1% and helps Bridge the digital divide Create 135,000 jobs

Return on Investments

Source: intel

Brazil:

Broadband services increased employment growth rate by +1% - 1.4%

Latin America/Caribbean:

10% rise in broadband penetration yields +1.7% in GDP growth.

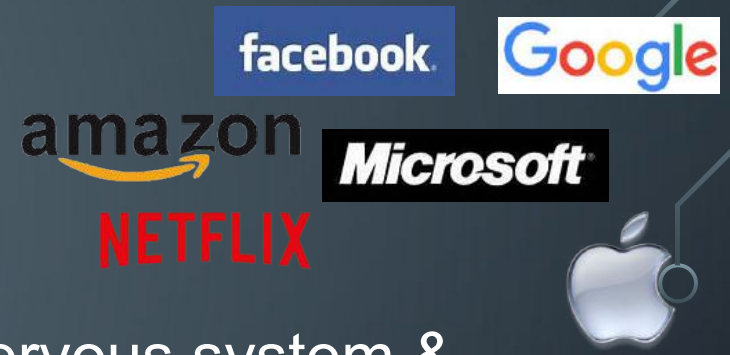
China:

Every 10% increase in dial-up/broadband contributes up to 2.5% to GDP growth.

Thailand:

Broadband could account for approx: 1% of the GDP growth rate.

Digital FAANG Wealth Generation



Networks and Data Centers are critical infrastructure – nervous system & heartbeat for: WebGiants, Large cloud providers, Colocation and Enterprises.

Finance world: **FAANG stocks** are known as Facebook (**F**B), Amazon (**A**MZN), Apple (**A**APL), Netflix (**N**FLX) and Alphabet (**G**OOG)

2020 FAANG companies market capitalization was over USD $4.1 trillion.

FAANG stocks traded on the **NASDAQ** and are part of the **S&P 500**, representing approximately **15% of the index**.

Worldwide public cloud services market circa 2019/20

USD $383 billion, up from US $209 billion in 2016. Gartner 2017

Local: Data Centre economic impact

Facebook's 1st Luleå site contributed 9bn SEK ($992m) of full economic impact.

Created 4,500 full-time jobs over 10 years (direct, indirect … impacts)

including 1,450 direct impact jobs.

According to BCG, Facebook 1st DC investments (Sweden) contributed 1.5% to the region's economy.

… well this is what happened !

- Population growth 2005-07 +13%
- 220 new Construction jobs
- Approx. $1.3bn Investment
- Salary growth 2005-07 +8%
- House prices 2005-08 +30%

Direct and indirect job numbers and Data Centres

USA Jobs and Investment: (circa 43% global data centre businesses) *Ave* data centre: 1,688 local construction workers employed, $244m output generated and $9.9m state/local Gov revenues. 157 local jobs created (ave) data centre. 2010-2016 data processing, internet publishing and other info services = $87bn GDP per year.

Google **USA:** 2016, Google provided $1.3bn economic activity, $750m job income and 11,000 total jobs. 1,900 direct data centre workers. 1,140 construction workers across 6 data centre campuses. Supply chain jobs at 3,500 and 70 direct jobs working on future renewable projects.

The job multiplier (1 direct job supports x additional non-Google Jobs) is 5.9 with a GDP multiplier of 6.6 (adding value to the wider economy). According to Oxford Economics, Google invested $10.5bn equipping their data centres, excluding manufacturing jobs. Google USA 2018: 9 facilities = Total investment $11.95 billion; contribution to local GDP $717 million; total related jobs around 7,565.

facebook

Facebook USA: 2018, Facebook spent $4.2bn on 4 data centres, total workforce +800. Projected 5+ years of operation average direct job per data centre to be 196. For each data centre worker an extra 5 jobs were needed (5x job multiplier). RTI International claim Facebook created 60,100 jobs (including total multiplier effect) between 2010-2016 from its $5.8bn GDP impact. **For every $1m spent on data centre operations 13.1 jobs were supported elsewhere in the economy and 14.5**

Direct and indirect job numbers and Data Centers

Netherlands/Germany: 2015 **Netherlands**, multi-tenant data centres (excluding telecoms) provided 2,300 direct full-time jobs and 1,300 indirect full-time jobs. 2015, 200,000 employees worked for the **German** data centre industry of which 120,000 were operational staff or

0.5% total number employed in the economy.

Wider job and GDP creation from ICT/Broadband/Internet

McKinsey's Global SME Survey: **for every 1 job lost to ICT 2.6 new jobs were created**, in line with a separate French study which showed 500,000 jobs lost over a 15 year period created 1.2 million others. It has been estimated that **4 to 5 jobs are create** economy for **each new ICT job** (European Commission, 2016; Moretti.)

The 'Employment and Social Development in Europe' 2016 report looked at employment in ICT and occupations between 2003 and 2013 and found it grew between 16% and 30% in 25 European countries. Over the last decade, **an extra 2,000,000 ICT** specialist jobs have been created, a million of which were created in the last 3 years (2018).

Direct and indirect job numbers and Data Centres

A Norwegian study (Menon 2017) a circa 100MW Data center (Hyperscale Data Center's) would add to the national economy approx 6,800 full time jobs. A further 450 jobs when fully operational.

Google **Finland:** The €800m Hamina Data Centre operational 2011. 50+ companies 2,000 people worked on the project. In 2017, 125 people work at the Data Centre. Oxford Research estimates: Next decade the Finnish Data Centre cluster economic impact could be €7-11 bn to a population is 5.5million Finn's.

Google **Belgium:** The economic impact of Googles Data Centre in St. Ghislain, Belgium (Copenhagen Economics report 2015) equates to over $900million of investment (between 2007-2014) and an average of 1,500 full time equivalent jobs.

Personal Economic Impact (developed nations)

Internet on Average:

$500 increase per capita GDP 1st 15 years.

The Industrial revolution took 50 years

… ANOTHER $500

From 2017 to 2025

Personal Economic Impact

80 Million Jobs maybe Automated in the next 5 years

Global workforce is 3.38 Billion (200m unemployed) = 2.4%

Digital Economy Fragmentation Risk

Risk for developing countries

Future data governance and data flows

Silos effecting economic futures

UNITED NATIONS UNCTAD

The approach to governing data and data flows

varies considerably among the major players in the digital economy, and there is little consensus at the international and regional levels.

What is a Data Centre ?

- Data Driven Critical infrastructure forming Edges…
- A Data Factory that processes digital workloads
- Moving Electrons & Photons (Power & Light)
- Engines of an outsourcing digital revolution
- An Asset Class *(the smart money know this already)*

Fun Finnish !

The Internet is the weight of 4 =

… We are in the Business of
moving 212+ grames of
Photons (γ) & Electrons (β−)
to provide services and revenue …

$$€ = E_k\,(\gamma + \beta^-) \times \tfrac{1}{2}mv^2$$

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KIITOS

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