Sustainable Digitalization: Why we need to shift away from Big Tech business models

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Hugues FERREBOEUF
Lean ICT Project Director: The Shift Project, the carbon transition think tank
Associate Director: Virtus Management, helping companies transform amidst transitions

hugues.ferreboeuf@polytechnique.org
Recent work

- **October 2018**
  - Why we need to implement a sobriety principle in the digital ecosystem to contain its carbon footprint

- **July 2019**
  - Video streaming: an analysis of the drivers leading to unsustainability

- **October 2020**
  - How to implement the sobriety principle? Methodological frameworks

- **March 2021**
  - 2025 outlook and 5G governance framework

- **October 2020**
  - Digital sobriety: a responsible corporate approach

- **June 2020**
  - Digital environmental footprint in France and public policies

- **December 2020**
  - 5G impact on digital environmental footprint in France

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**Corporate digital sustainability strategies**

- Digital industry players
- Insurance, Luxury
- Public organizations
The context

Efficiency and affluence

The Big Tech business models: drivers of unsustainability

The way forward

https://digitalization-for-sustainability.com/publications/
The context
Digitalization is currently unsustainable. The growth is sustained and will continue except if there is a shift towards digital sobriety/sufficiency.

Current trend would eat up 15% of global GHG reduction by 2030.
Digitalization has not resulted in decoupling growth and energy consumption.

The ICT sector needs to transform deeply

**Digital Reset**
A fundamental redirection of the purpose of digital technologies for the deep sustainability transformation
The ICT sector needs to transform deeply

Seven Principles for a Digital Reset

- Regenerative Design
- System Innovations
- Sufficiency
- Circularity
- Sovereignty
- Resilience
- Equity
Efficiency and affluence
Technology affluence grows more than energy efficiency

Digital CO2 footprint = Population × Digital Technology Affluence × Energy Intensity of Technology × Carbon Intensity
Technology affluence grows more than energy efficiency

End user devices

Networks

Data centers

\[
CO_2 e = \frac{\text{Users}}{\text{User}} \times \frac{\text{Transistors}}{\text{User}} \times \frac{\text{Wafers}}{\text{Transistor}} \times \frac{\text{kWh}}{\text{Wafer}} \times \frac{CO_2 e}{\text{kWh}}
\]

\[
CO_2 e = \frac{\text{Users}}{\text{User}} \times \frac{\text{GB}}{\text{User}} \times \frac{\text{kWh}}{\text{GB}} \times \frac{CO_2 e}{\text{kWh}}
\]

\[
CO_2 e = \frac{\text{Users}}{\text{User}} \times \frac{\text{Workload}}{\text{User}} \times \frac{\text{J_T}}{\text{Workload}} \times \frac{\text{kWh}}{\text{J_T}} \times \frac{CO_2 e}{\text{kWh}}
\]
Digital affluence (excessive growth of) is the issue

Digital CO2 footprint = Population × Digital Technology Affluence × Energy Intensity of Technology × Carbon Intensity

IEA 4E EDNA, 2019
Digital affluence (excessive growth of) is the issue
Digital affluence hypergrowth: a systemic issue
We face a system design issue.
We face a system design issue

Digital technology affluence is growing due to societal and economic behaviours:

- Digital consumers unaware of the impacts (environment, health, behavior etc) and digitally hungry
- Enterprises engaged in digital transitions without connecting them to increasingly stringent environmental/energy transitions (eg IOT)
- Public authorities encouraging indiscriminate “digital transition projects » bound to yield economic growth
- Software-induced obsolescence boosting hardware production in line with linear business models
- Big Tech (GAFAM, BATX) relying on audience maximization (two-sided market business model) and using addictive design techniques
The Big Tech business models: drivers of unsustainability
Market dominance
The Big Tech are financial superpowers

<table>
<thead>
<tr>
<th>Company</th>
<th>Market capitalization (B$, 2020)</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>APPLE</td>
<td>2300</td>
<td>1</td>
</tr>
<tr>
<td>MICROSOFT</td>
<td>1700</td>
<td>3</td>
</tr>
<tr>
<td>AMAZON</td>
<td>1600</td>
<td>4</td>
</tr>
<tr>
<td>ALPHABET/GOOGLE</td>
<td>950</td>
<td>5</td>
</tr>
<tr>
<td>FACEBOOK</td>
<td>800</td>
<td>6</td>
</tr>
<tr>
<td>TENCENT</td>
<td>700</td>
<td>7</td>
</tr>
<tr>
<td>ALIBABA</td>
<td>650</td>
<td>9</td>
</tr>
<tr>
<td>NETFLIX</td>
<td>240</td>
<td>33</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>~ 9000</td>
<td></td>
</tr>
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The Big Tech overpower the ICT sector

Digital ecosystem revenue¹
World, 2011-2020, billion euros²

The Big Tech create the market dynamics

75% of total Internet traffic growth

2021

Global Smart Speaker Market Share By Vendor

<table>
<thead>
<tr>
<th>Application Group</th>
<th>Total Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Google</td>
<td>20.99%</td>
</tr>
<tr>
<td>2 Facebook</td>
<td>15.39%</td>
</tr>
<tr>
<td>3 Netflix</td>
<td>9.39%</td>
</tr>
<tr>
<td>4 Apple</td>
<td>4.18%</td>
</tr>
<tr>
<td>5 Amazon</td>
<td>3.68%</td>
</tr>
<tr>
<td>6 Microsoft</td>
<td>3.32%</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>56.96%</strong></td>
</tr>
</tbody>
</table>

Sandvine Global Internet Report, 2021
Digital affluence as a production factor
Digital affluence fueling financial value

- Big Tech are Multi Sided platforms
- Audience monetization as major source of revenue
- Value capture = $f(#\text{users}, \text{user engagement})$
- Addictive design and data intensive content to attract, stimulate and retain users
- Digital affluence as a (free) production factor
The Big Tech business models: energy intensive, data hungry

CAGR 2015-2020

<table>
<thead>
<tr>
<th></th>
<th>Google</th>
<th>Meta</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue</td>
<td>20,0%</td>
<td>37,0%</td>
</tr>
<tr>
<td>Energy consumption</td>
<td>24,0%</td>
<td>40,0%</td>
</tr>
<tr>
<td>Market capitalization</td>
<td>20,0%</td>
<td>21,0%</td>
</tr>
<tr>
<td>Revenue energy intensity</td>
<td>3,8%</td>
<td>2,7%</td>
</tr>
<tr>
<td>Internet traffic</td>
<td>42,0%</td>
<td>60,0%</td>
</tr>
</tbody>
</table>

(CAGR Internet traffic 2015-2020 = 29%)
Misleading carbon neutral strategies
Sustainability across the value chain
The Big Tech’s value chain cannot be sustainable (1)

“Carbon –neutral” strategies: all Big Tech will power all their sites (data centers) with renewable energy by 2030

Carbon neutrality in 2050 needs GHG emissions to be reduced by half in 2030 (source: IPCC 2022)

Carbon intensity of electricity: 2019 = 0,6 kgCO2/kWh  2030 Big Tech = 0,06  2030 value chain = 0,3

<table>
<thead>
<tr>
<th>Assumptions</th>
<th>2019</th>
<th>CAGR 2019/2025</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hyperscale data centers: electricity consumption (TWh)</td>
<td>70</td>
<td>15.8%</td>
<td>349</td>
</tr>
<tr>
<td>Networks: electricity consumption (TWh)</td>
<td>349</td>
<td>5.0%</td>
<td>598</td>
</tr>
<tr>
<td>End-user devices electricity consumption (TWh)</td>
<td>505</td>
<td>7.5%</td>
<td>1120</td>
</tr>
<tr>
<td>Hyperscale data centers: share of total data center workload</td>
<td>0.48</td>
<td>4.0%</td>
<td>0.81</td>
</tr>
</tbody>
</table>

Source: The Shift Project, 2021

GHG(data centers, networks, devices) = ELEC(data centers, networks, devices) * (carbon intensity of electricity)
The Big Tech’s value chain cannot be sustainable (1)

ELEC\textsubscript{2019}(\text{Big Tech}) = 70 \text{TWh}  \quad \rightarrow \quad \text{ELEC\textsubscript{2030}(Big Tech)} = 349 \text{TWh}

GHG\textsubscript{2019}(\text{BigTech}) = 42 \text{MtCO2}  \quad \rightarrow \quad \text{GHG\textsubscript{2030}(BigTech)} = 21 \text{MtCO2}

« Greening » 100% of their electricity consumption DOES reduce by half Big Tech’s scope 2 emissions
The Big Tech’s value chain cannot be sustainable (2)

ELEC\textsubscript{2019}(value chain) = 480 TWh  \quad \xrightarrow{+260\%} \quad ELEC\textsubscript{2030}(value chain) = 1.740 TWh

GHG\textsubscript{2019}(value chain) = 288 MtCO\textsubscript{2}  \quad \xrightarrow{+50\%} \quad GHG\textsubscript{2030}(value chain) = 438 MtCO\textsubscript{2}

Big Tech “carbon –neutral” strategies will actually drive up by 50% the carbon footprint of their value chain

Indirectly they perpetuate the myth of decoupling digital hypergrowth and carbon emissions
The way forward
Where to: alternative platform business models

Moving away from business models where revenue is generated by the sale of user-related information in exchange to free access to platform services and where the capture of user-related data is optimized thanks to addictive design techniques and digitally rich targeted advertising.

Examples

- Subscription-based services (e.g., mail, search, etc.)
- Cooperative platforms: voluntary provision of specific personal data, buyer/seller community
  - Platformization of existing cooperatives
  - Start-ups
- Public platforms
How: public policies forcing changes

- **Make Big Tech smaller**: taxes, regulations, anti-trust measures etc...

- Make Big Tech business models less financially attractive: reinternalize externalities (e.g., network costs)

- Enforce scope 3 (value chain) carbon footprint measurement

- Forbid the acquisition of personal data by default (# current terms of reference)

- Support and adopt new web standards (web 3?) giving individual users full control over the usage of their data

- Support (including financially) alternative platforms
Questions ?

https://digitalization-for-sustainability.com/publications/