Foresight for Digital Development
Hilbert & López (2011). The world’s technological capacity to store, communicate and compute information.

*Science, 332, 6025, 60-65

www.martinhilbert.net/WorldInfoCapacity.html

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Storage in optimally compressed MB

Stored digital information has doubled every 2.5 years

\( \approx 5 \text{ ZB in 2014 (} 5 \times 10^{21} \text{ Bytes)} \)

130 years with 130 km/h

4,500 piles of double printed books

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18.86 billion gigabytes

- Paper, film, audiotape and vinyl: 6.2%
- Analog videotapes: 93.8%
- Other digital media: 0.8%
- Portable media players, flash drives: 2%
- Portable hard disks: 2.4%
- CDs and minidisks: 6.8%
- Computer servers and mainframe hard disks: 8.9%
- Digital tape: 11.8%
- DVD/Blu-ray: 22.8%
- PC hard disks: 44.5%

123 billion gigabytes

*Other includes chip cards, memory cards, floppy disks, mobile phones/PDAs, camcorders/camcordors, video games

276.12 billion gigabytes
185 MM tweets U.S. Echelon Insights (2014)

Digital footprints

The Economist. (2014). Off the map.

TED-Ed. (2013). Visualizing the world’s Twitter data - Jer Thorp.
Big Data Development Indexes

Thomson Reuters MarketPsych Indices (TRMI)
18,864 separate indices, across 119 countries, updated each minute (!)

Bubbleometer = [positive – negative] emotionality and expectations

PriceForecast = news predictions of [asset price rises – drops]
Individual **human genomes**: $1 \times 10^{19}$ bytes

**Digital information**: $5 \times 10^{21}$ bytes

**All DNA nucleotides**: $5 \times 10^{37}$ bytes

... *digital growing at 30-40 % per year*

$\Rightarrow$ doubling of info on Earth during next century!

**Storage capacity human brain**: $10^{12} = $ digital storage per capita $\left(\frac{5 \times 10^{21} \text{ Bytes}}{7.2 \times 10^9 \text{ people}}\right)$

**Synaptic nerve impulses human brain**: $1 \times 10^{17} = $ world’s general purpose computers in 2005!
Simulating changing futures

Sources: Bohemia Interactive Simulations, http://youtu.be/G9P9bUTCdpA; SimCityEDU; TRANSIMS: http://www.youtube.com/watch?v=mN7kq0ITAys; Epstein, http://www.youtube.com/watch?v=WWzICIGtVkw
Google DeepMind's Deep Q-learning

The algorithm will play Atari breakout.

The most important thing to know is that all the agent is given is sensory input (what you see on the screen) and it was ordered to maximize the score on the screen.

No domain knowledge is involved! This means that the algorithm doesn't know the concept of a ball or what the controls exactly do.
Collective of “technology is indeed a living organism”

...and we are merging with it:

✓ **pervasively:** $\frac{2}{3}$ of our awake time mediated
✓ **trustingly:** car anti-lock braking & plane autopilots
✓ **dependently:** resource allocation ($\frac{3}{4}$ US stock market) & energy supply (power grid)
✓ **intimately:** $\frac{1}{2}$ MM cyborgs w/ cochlear implants & $\frac{1}{3}$ marriages matched online
✓ **transparently:** filter information & detect personality

Center for Digital Future, 2014; Ochsner et al., 2015; Hendershott et al., 2011; Ramchurn et al., 2012; Cacioppo et al., 2013
Particularities of interventions for digital development

- Uncertainty of trajectory
- All-pervasiveness
- Unpredictability of side-effects
- Internationality of digital networks

- Short-term flexibility
- Decentralized agenda
- Private-public alliance
- International coordination
Long term vision & short term actions

Guiding Principles World Summit

2005

Short term Action Plan
Río de Janeiro 2005

Benchmarking and evaluation
El Salvador 2007

eLAC2007

2007

Short term Action Plan
San Salvador 2008

Benchmarking and evaluation
Peru 2010

eLAC2010

2010

Short term Action Plan
Lima 2010

Benchmarking and evaluation
Mexico 2015

eLAC2015

2015

Long term goals World Summit
Multi-stakeholder consultations

Confronting uncertainty through broad consultations  
(diverse input + shared responsibility)

eLAC Policy Priority Delphi: 16 international institutions + 1,454 contributions

Professional affiliation

- Civil Society: 12%
- Academia: 24%
- Private Sector: 39%
- Public Sector: 25%

Educational level

- University: 36%
- Master or PhD: 62%
- No university: 2%
eLAC2007 → eLAC2010

lost importance:
• ICT for environment
• Internet Governance
• Local production of ICT goods and service
• ICT for cultural heritage
• Creative industries and content
• Free and open source software
• Alternative new technologies

+ new areas of interest:
• e-Democracy
• Civil participation
• e-Commerce
• Tele-medicine
• Gender perspective
• Intellectual Property
• Voice-over IP

Broadening the scope of thematic areas
Review priorities of eLAC2007 and gather new topics

Consolidating priority thematic areas
Prioritize areas of interest

Elaboration of policy options
Identify concrete goals and formulate policy actions

Consolidating policy options
Improve and prioritize

Fine-tune policy options
Fine-tune through face-to-face consultation

Areas of interest

Policy options

Inter-governmental negotiation

eLAC2007 (Regional Action Plan 2005-2007)

- Round one: Virtual Voting on Likert scale
  155 contributions

- Round two: Virtual Voting on Likert scale
  501 contributions

- Round three: Personal Personal interviews
  116 contributions

- Round four: Virtual Various voting types
  618 contributions

- Round five: Personal Workshop
  64 contributions

Regional Consultation Meeting, Buenos Aires, Oct. 2007
71 participants, from 18 countries and 20 regional agencies

Regional Ministerial Conference, Quito, May 2005
Regional Ministerial Conference on the Information Society, Rio de Janeiro, June 2005

Written online comments on draft version
14 country contributions and 11 contributions from agencies

210 participants, from 29 countries and 56 regional agencies

“...the most extensive online participatory policy-making foresight exercise in the history of intergovernmental processes in the developing world…”