Session 4-5. Advances in computing and communication

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Digital Transformation of the World Economy

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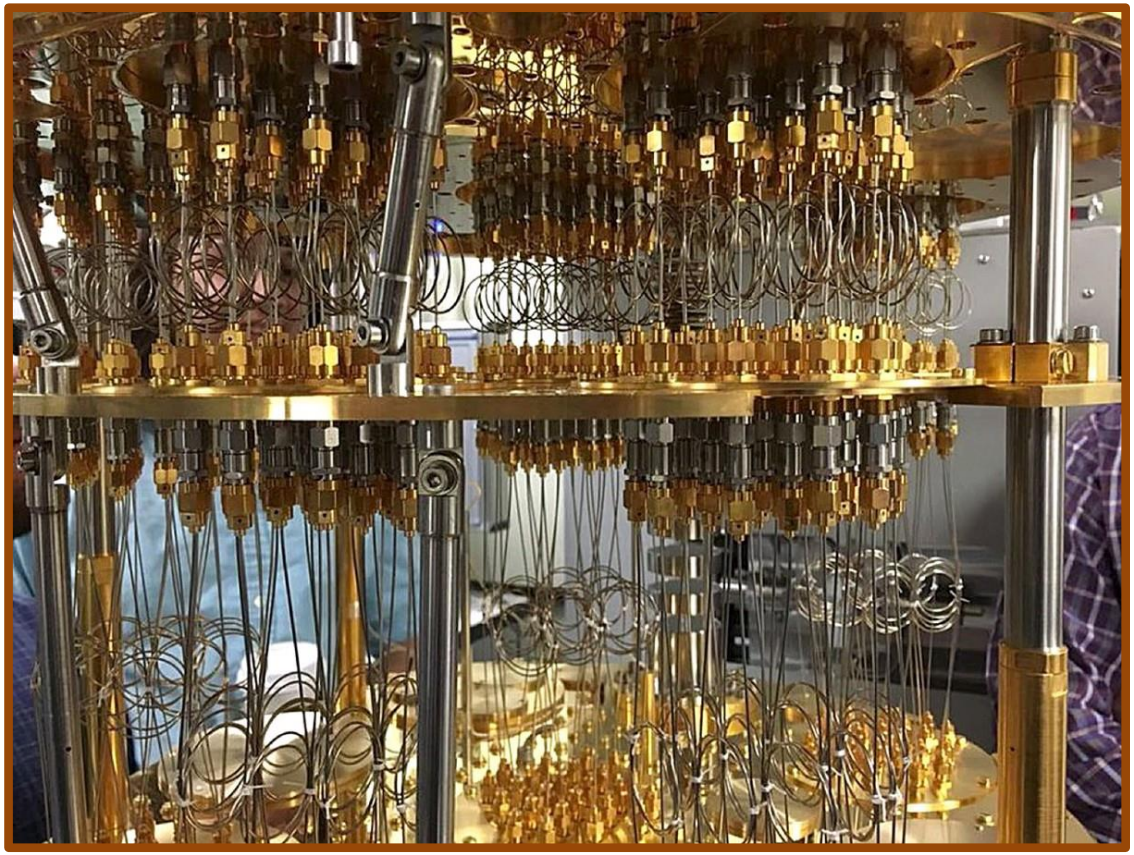
Plan

- Reflection from last session
- Advances in computing
- Advances in communication
- Midterm evaluation

Reflection

- Network effect
- Economies of scale
- Economies of scope
- Approaches to digital transformation policies
  - Government-led vs private sector led (examples)
  - Top-down vs bottom-up (examples)
  - Innovation vs regulation (examples)



Advances in Computing

Evolution of computing power

- 1st computers – little capacity for memory and information retrieval
  - ***arithmetical benefit***
- Development of magnetic core memories
  - ***non-arithmetical benefit*: *lower marginal cost of reproducing information***
- Thermionic technology
- Semiconductor technology
- Microprocessor (*a computer on a chip*)

Computing power growth

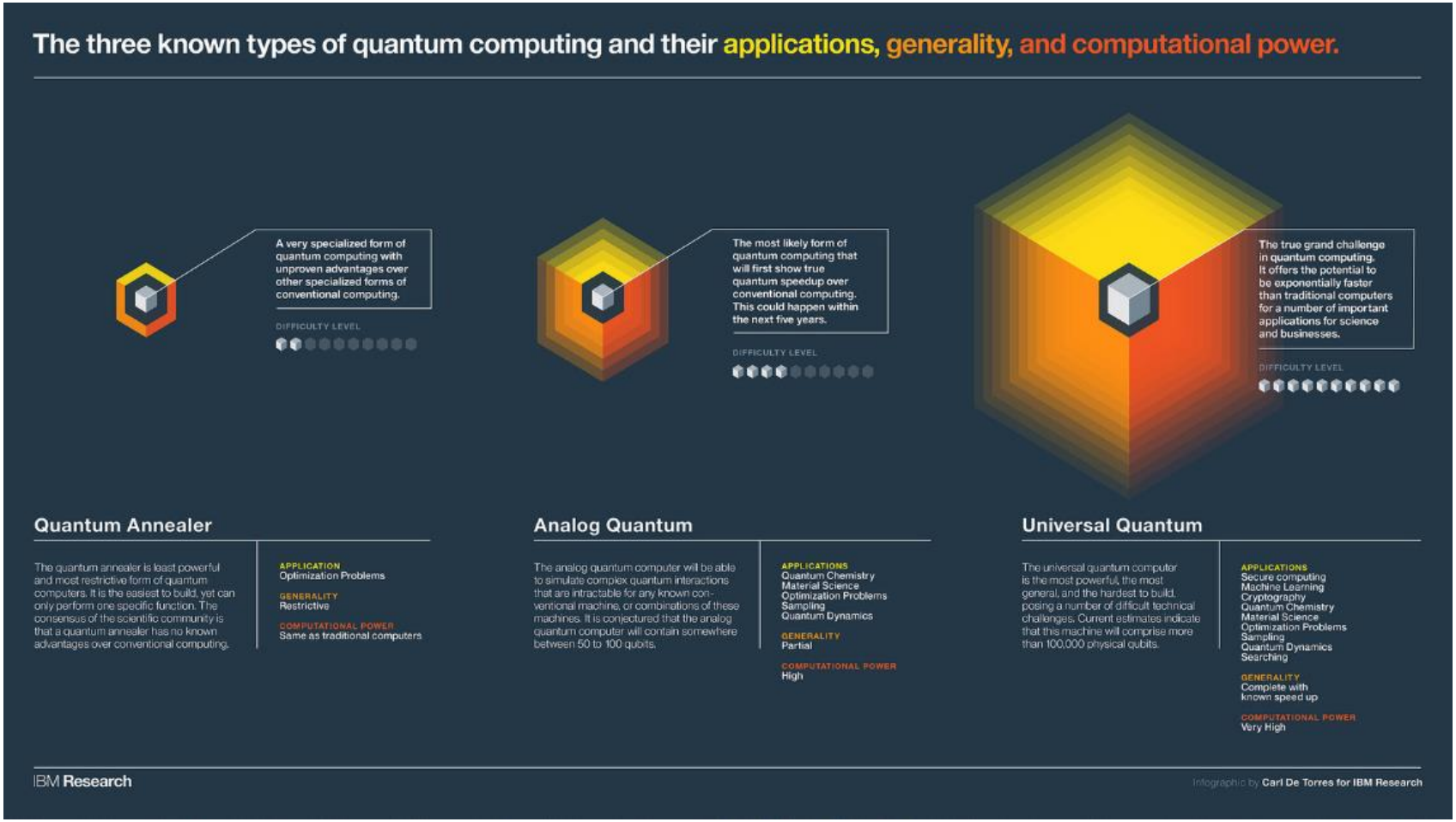
- Moore's Law of Productive Technology
  - G. Moore - former chairman of Intel, one of the founding fathers of the chip industry
  - available computing power quadruples every 30 months
- Computing power as measured in MIPS (*million instructions per second*)
- Expression of computing power growth: 2 to the power of n where n is the current year minus 1986

  1987: 2^1 = 2 MIPS (1987 – 1986)
  1997: 2^{11} = over 2 BIPS (1997 - 1986)

- Next steps - quantum computing

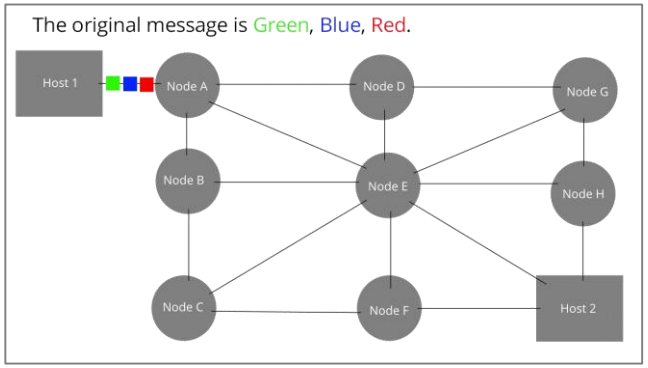
Physical limits of computing

Quantum computing



Computers' effect on economy

- Limited communication between computers = limited effect on the economy
- Key inventions of 1960-70s
  - packet switching to break & re-assemble messages
  - TCP/IP - defines internet communication
- Browsers and search engines layered on top of TCP/IP
  - increased collection and use of data



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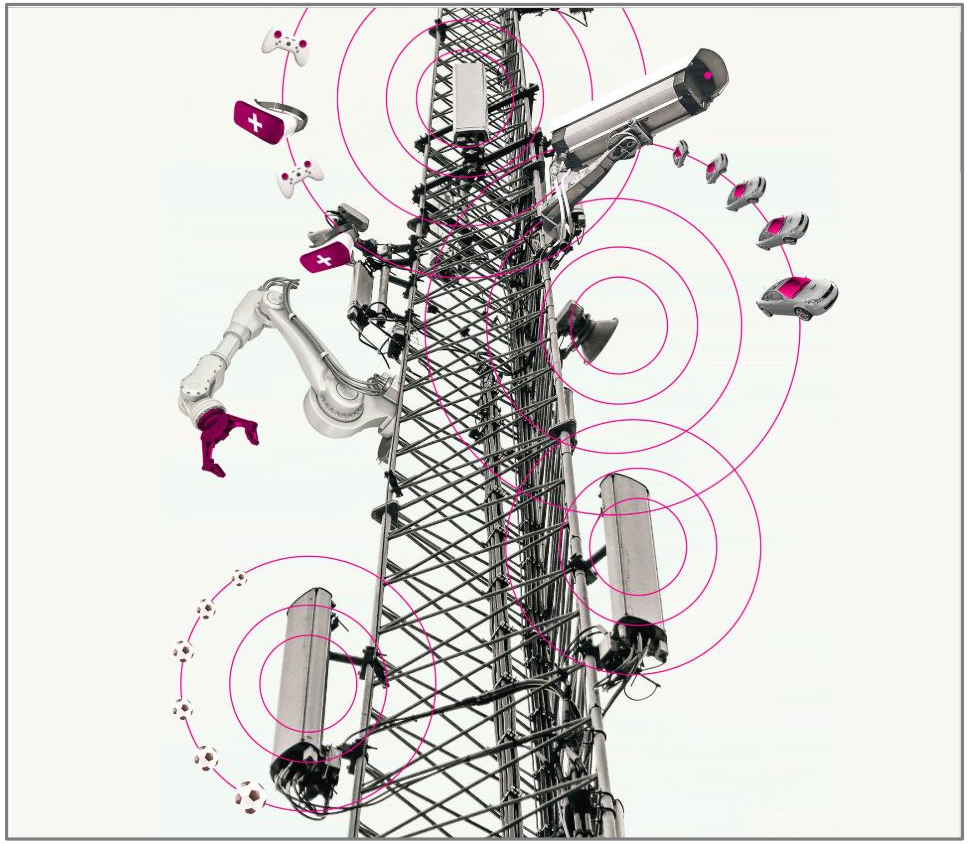
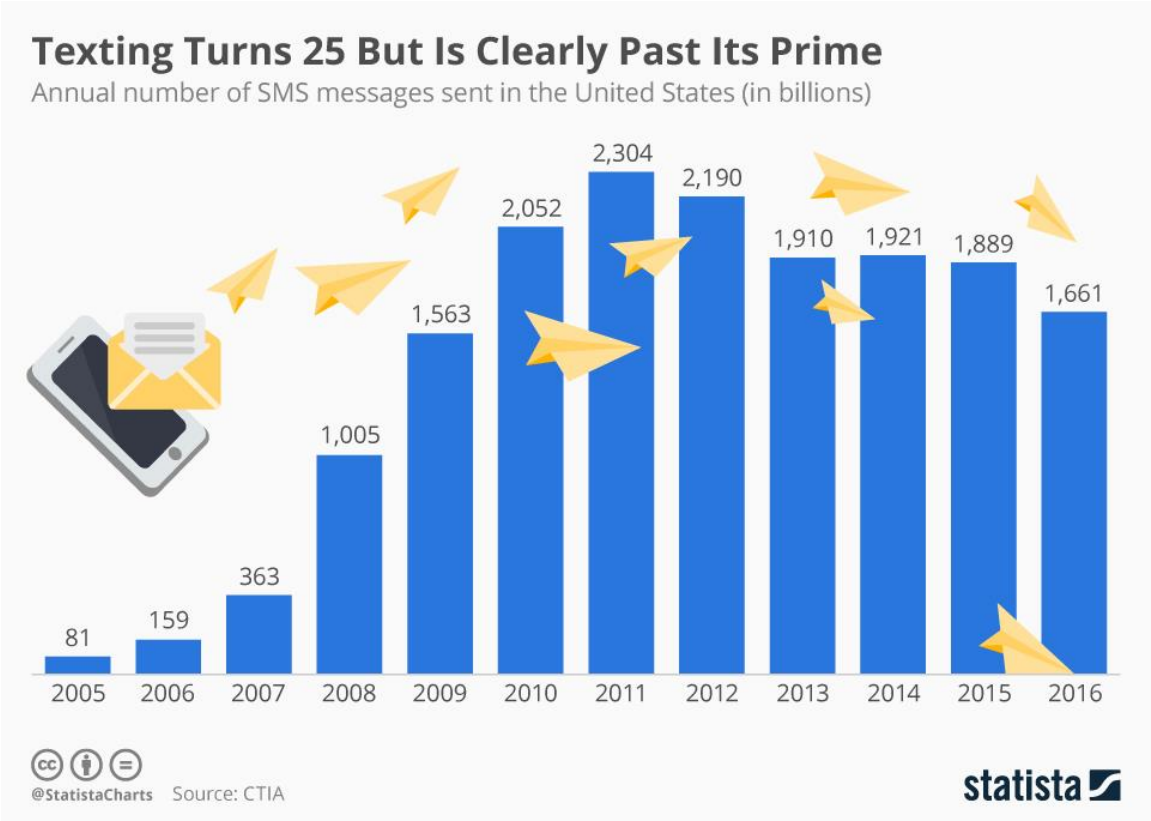
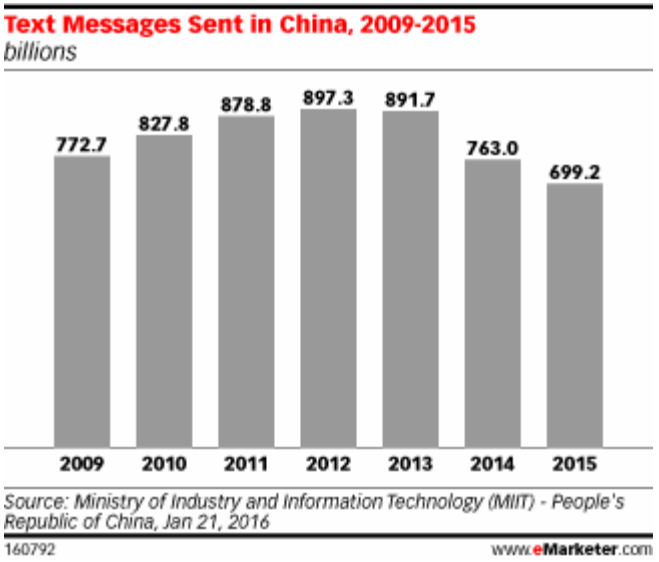


Advances in Communication

Evolution of communication



Orbitel-901
Released: 1992
Display: LCD
Weight: 2,1kg



Motorolla-Micro 1989
Price tag: $3000

Communication as economic enabler

- The mobile web
  - 2014 mobile data traffic increased by 81%
  - PC activities are moving to mobile devices
- Geospaciality
  - Web surfing is now augmented
- Internet of Things
  - Possibility for exponential change in business model innovation

Communication as enabler – cont.

- The Cloud
  - Internet as global computer on which human activity *creates value*
  - For companies - decreases costs and increases integration
  - Software as a Service (SaaS): users log into a service or program without having to install (examples: Amazon, Google, Oracle Cloud)
- OVERALL: **decentralization of internet activity**

Net neutrality

- Internet service provider should treat all data in the same way
  - regardless of *provider*
  - regardless of *content*
    - (*internet service provider vs internet content provider*)
- Companies cannot pay an internet service provider to have faster speeds
  - Netflix pays the same to send a gigabyte of data to one of their customers as a small startup would pay to send data to the same customer.

3G vs 4G vs 5G in in everyday life

Downloading an hour-long playlist
from Spotify - music streaming service

https://www.wsj.com/graphics/how-fast-5g-mobile-internet-feels/

3G vs 4G vs 5G in in everyday life

Downloading ‘Bird Box’ for offline viewing on Netflix

https://www.wsj.com/graphics/how-fast-5g-mobile-internet-feels/

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Downloading ‘Fortnite’ for iOS

https://www.wsj.com/graphics/how-fast-5g-mobile-internet-feels/

Midterm evaluation

- Your feedback on
  - the course and my teaching
- Your ideas are important to me
- I am serious about improving the course and your learning
- Format
  - low-stakes - anonymous