

A Digital World

Prof. Fabio Ciravegna

Dipartimento di Informatica

Università di Torino

fabio.ciravegna@unito.it



Moore's, Nielsen's and Disk Space Law

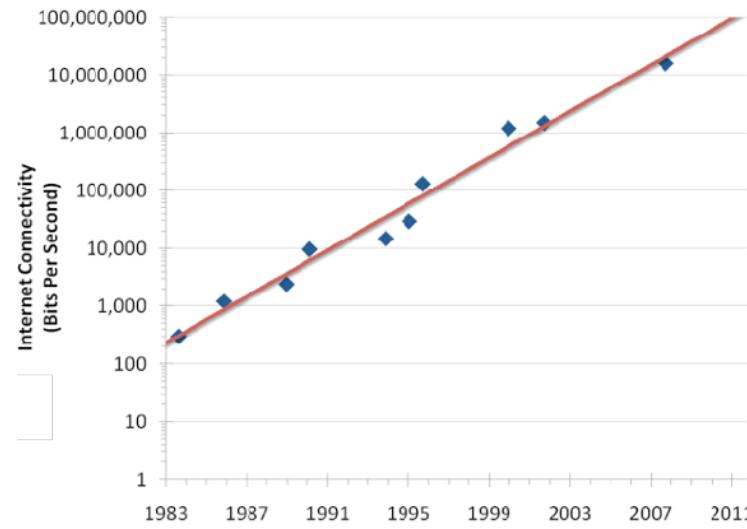
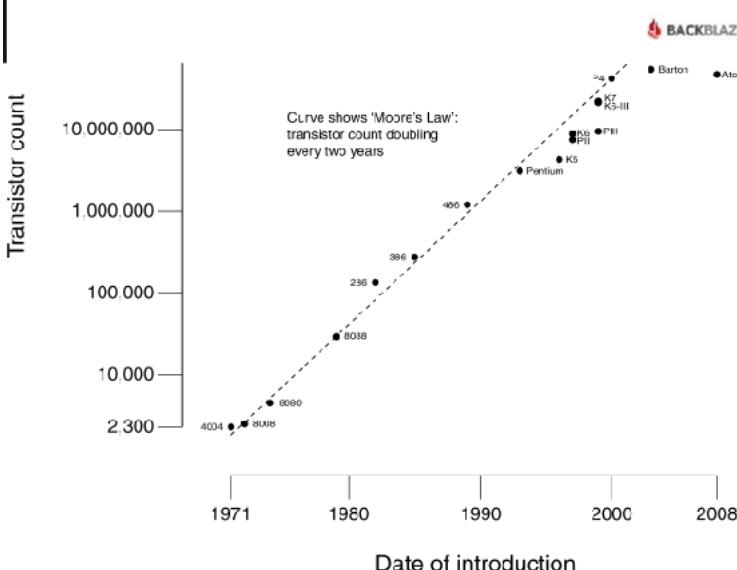
Backblaze Average Cost per GB for Hard Drives

By Quarter: Q1 2009 - Q2 2017



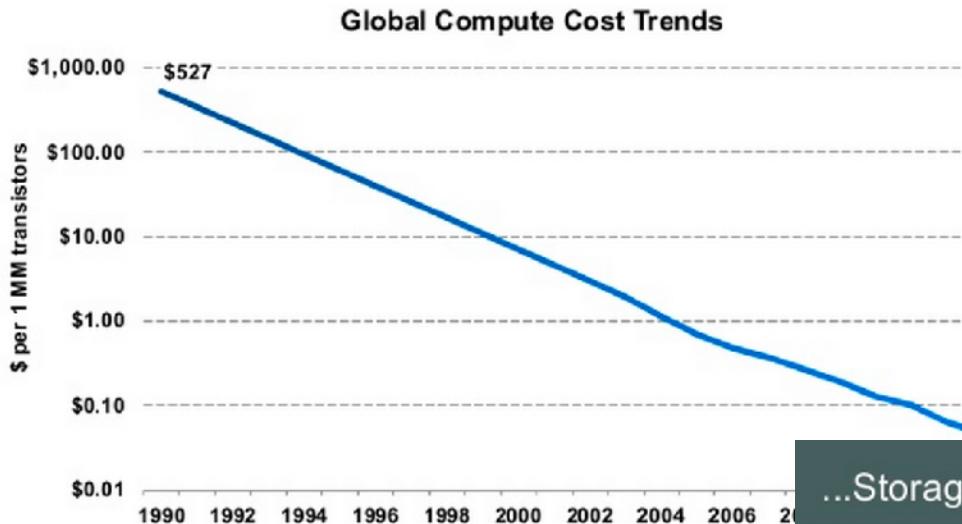
Computer power, speed of broadband and disk storage capability doubles every year (same cost)

The same computer power, speed of broadband and disk storage capability will cost half the current price in 2 years' time (and basically will use half space)



Compute Costs Declining = 33% Annually, 1990-2013...

Decreasing cost / performance curve enables computational power @ core of digital infrastructure...



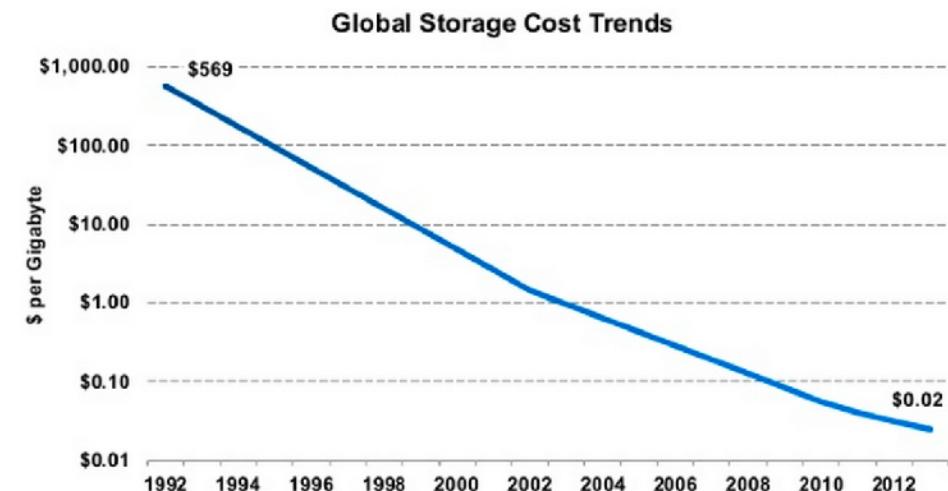
<http://www.kpcb.com/internet-trends>

...Storage Costs Declining = 38% Annually, 1992-2013...

@KPCB

Note: Y-axis on graph is logarithmic scale.
Source: John Hagel, Deloitte, 5/14.

Decreasing cost / performance of digital storage enables creation of more / richer digital information...



Then by applying linearly these laws

	2023	2028	2033	2038
Networks	500M	3G	16G	96G
Computers	£600	£3,600	£19,200	£115,200*
Disks	1T	6T	32T	192T

* The equivalent to 192 computers

You do not believe it?

50 years ago and today



Source: <https://www.slideshare.net/sqrajper/mobile-computing-24722802>

Technology Cycles – Still Early Cycle on Smartphones + Tablets, Now Wearables Coming on Strong, Faster than Typical 10-Year Cycle

Technology Cycles Have Tended to Last Ten Years

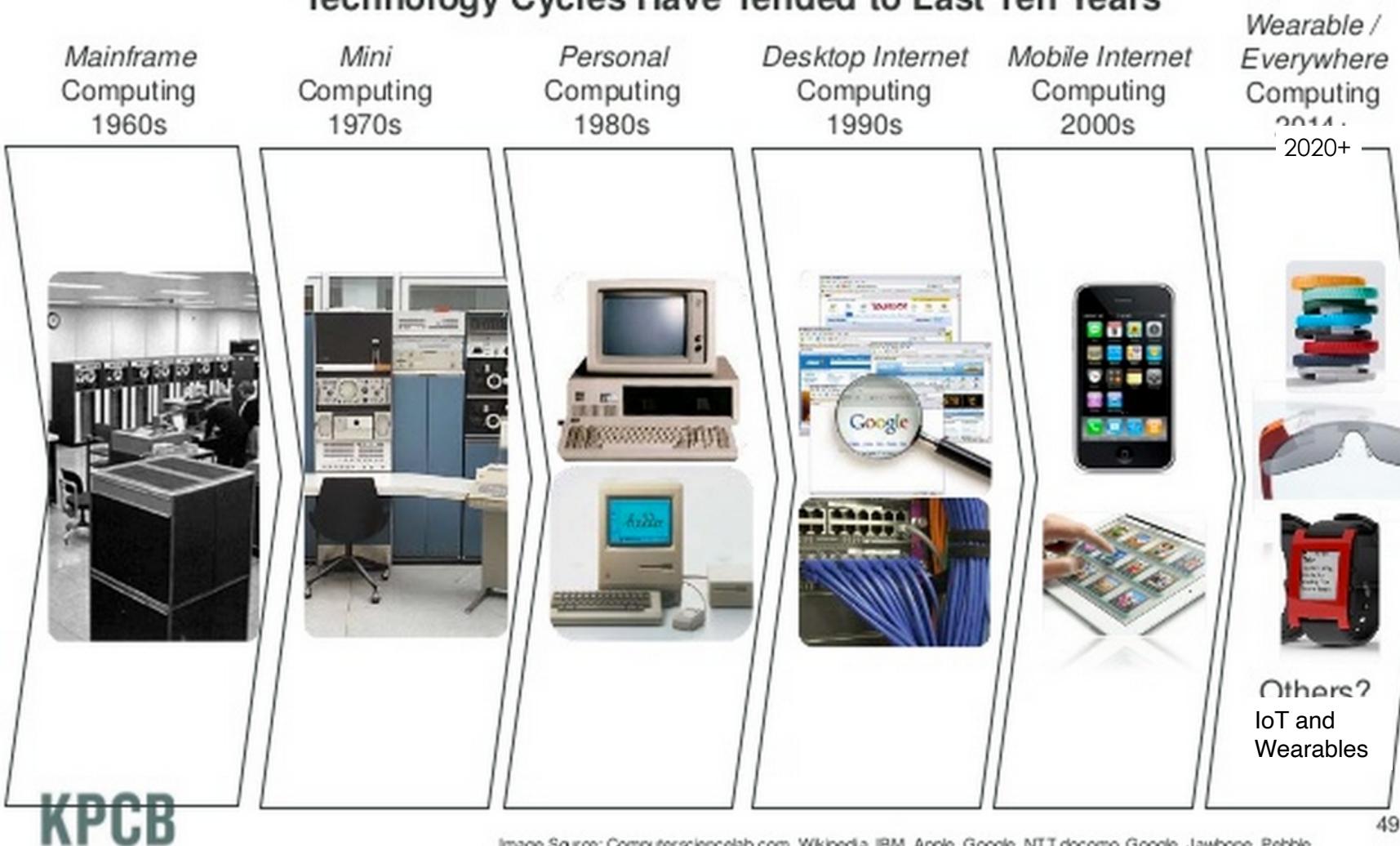


Image Source: Computersciencelab.com, Wikipedia, IBM, Apple, Google, NTT docomo, Google, Jawbone, Pebble.

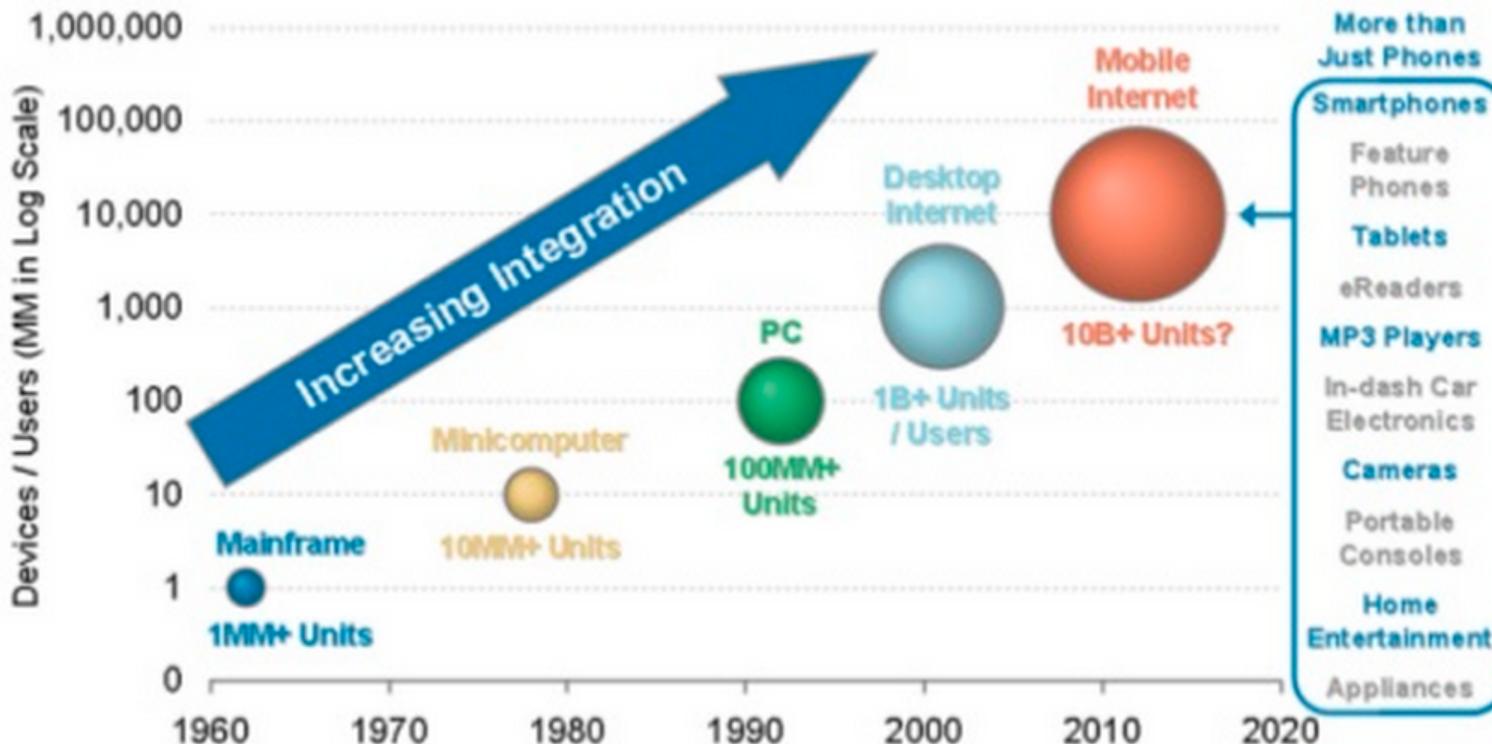
49

Each New Computing Cycle = 10x > Installed Base than Previous Cycle

Exhibit 29

**Each new computing cycle typically generates
around 10x the installed base of the previous cycle**

Devices or users in millions; logarithmic scale



The Digital World

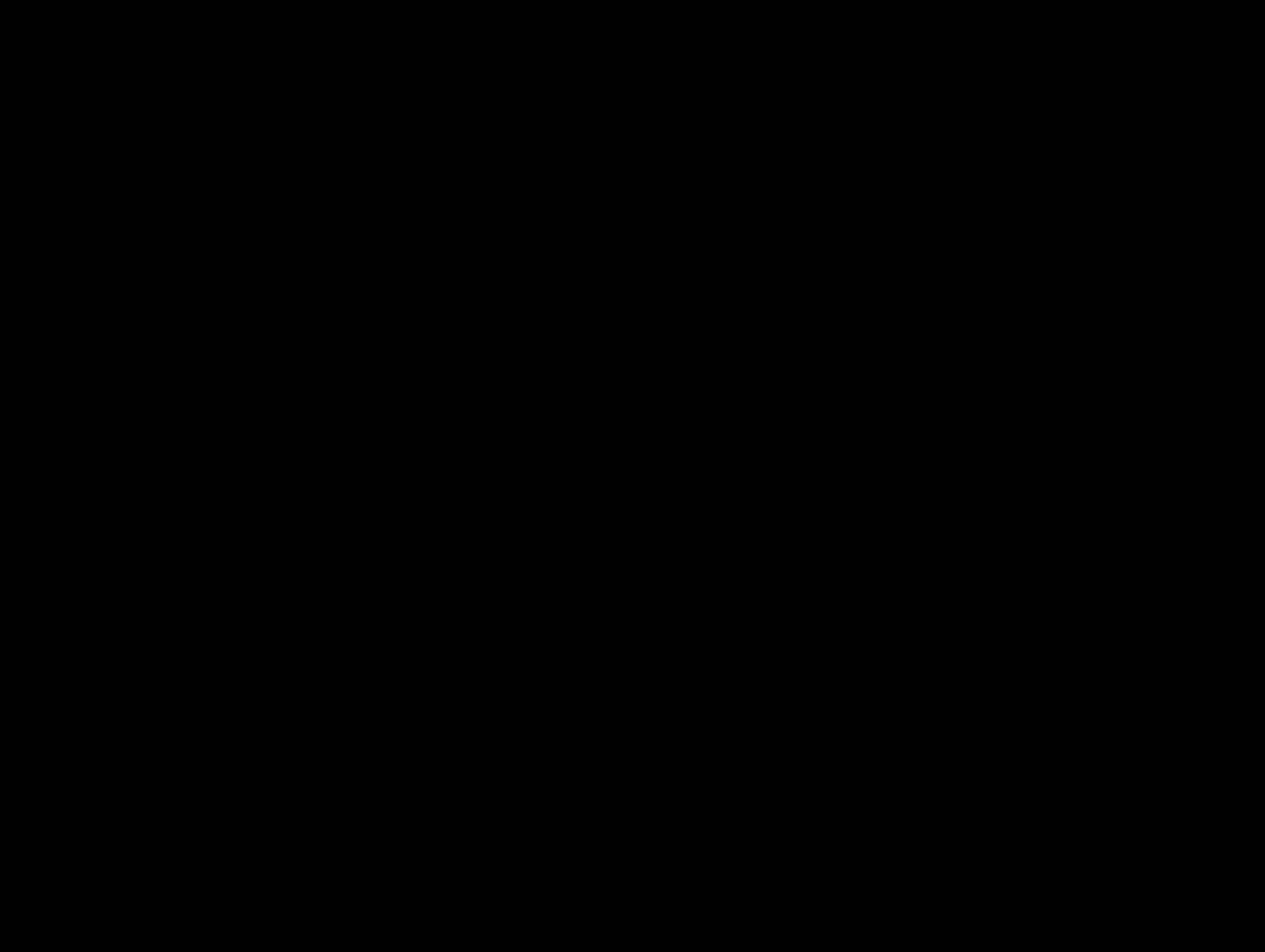
- Analysis of requirements of real users
- Development and use of Digital Technologies
- Study of their impact on the society
- (repeat)

Building a Digital Knowledge Economy in the 21st Century will be fundamental to the UK's future prosperity. For the country to reap the maximum benefits, we need to put people at the centre of all our digital thinking.

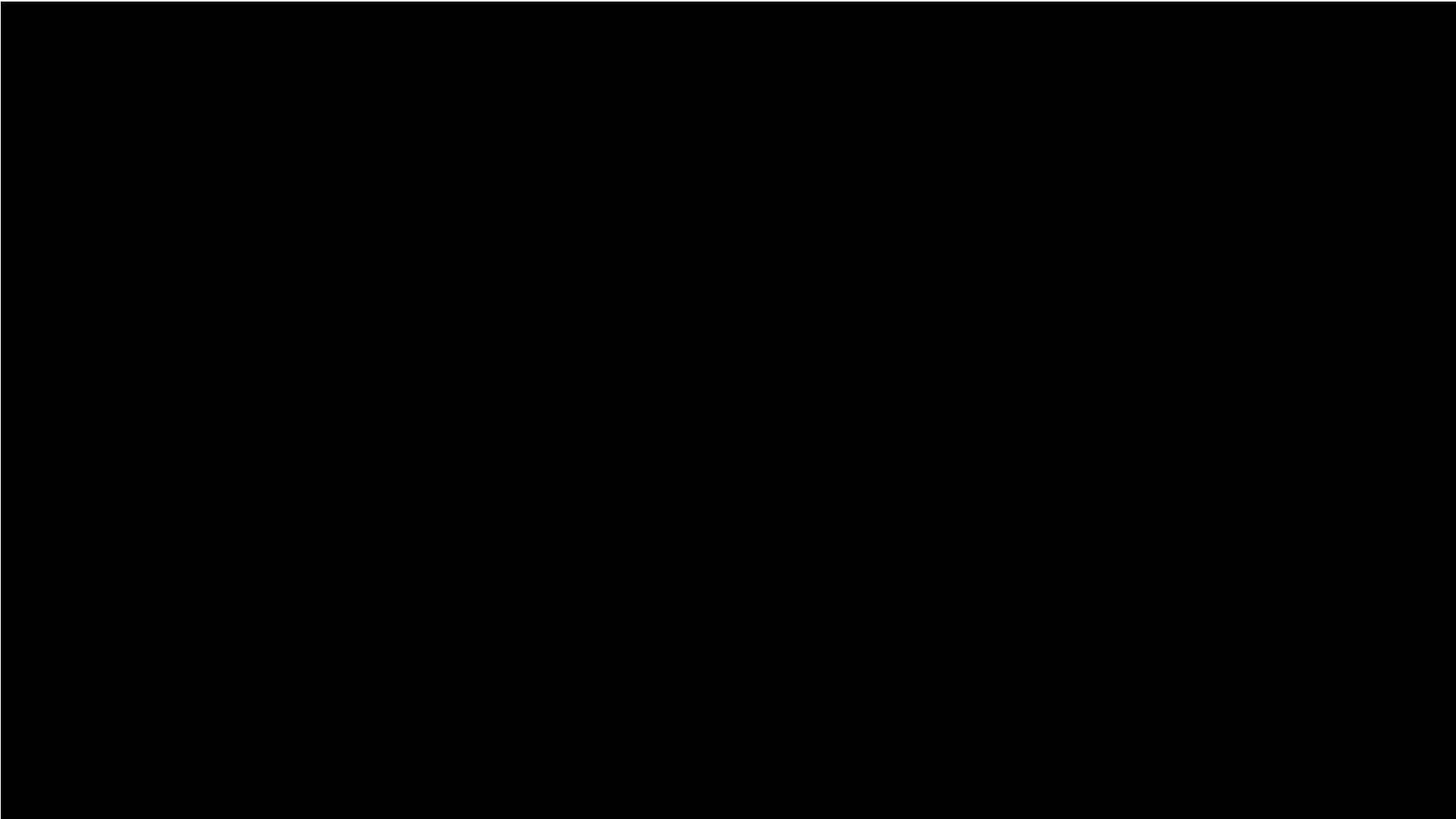
Digital Britain, Final Report, June 2009



No longer office machines



In my eyes (not an office machine)



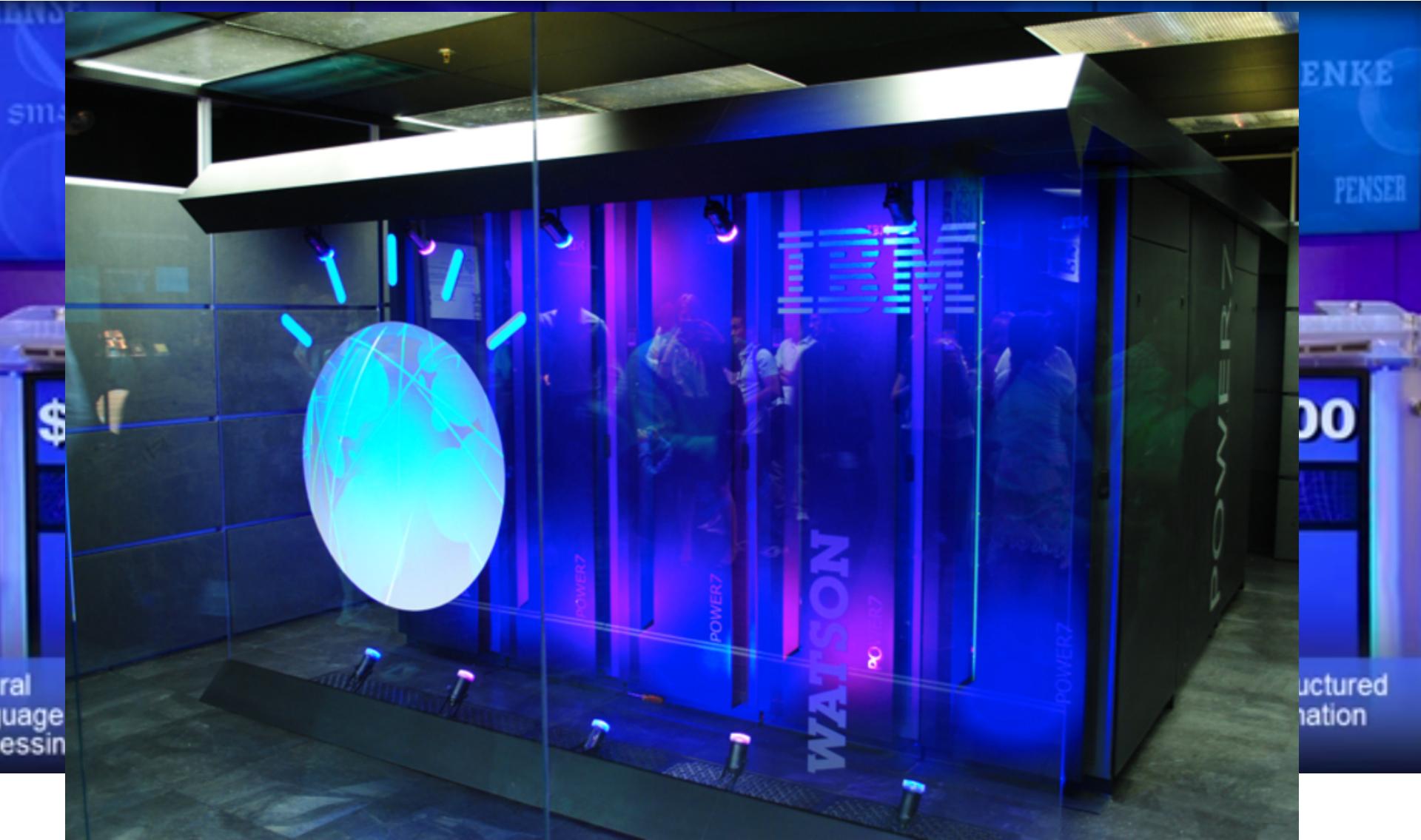
What is important here is the idea, not the actual product (which failed from a commercial po

amazon echo

amazon.com/echo



Watson



You as focus

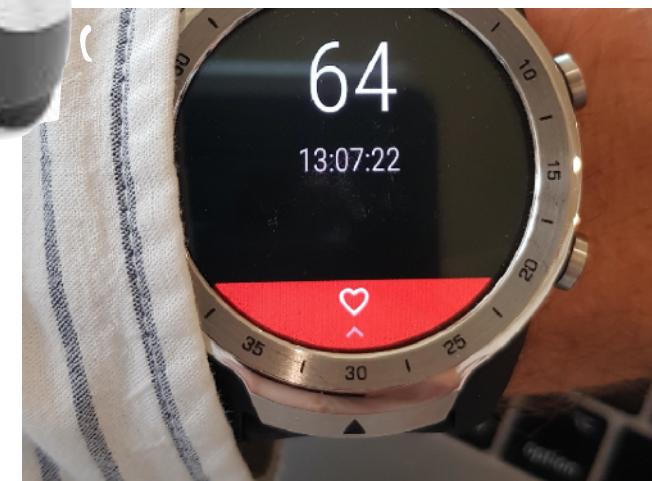
- The digital world is not (only) about developing digital technologies
- It is about **PEOPLE** having those technologies
 - With you
 - Around you
 - 24/7
- It is about those instruments communicating
 - To create a global communication system
 - To provide the **right information** at the right time

The shape of things to come

And yes before you ask, these are all web technologies
(surely you were not thinking of studying Web pages in this module?)



It is about Health

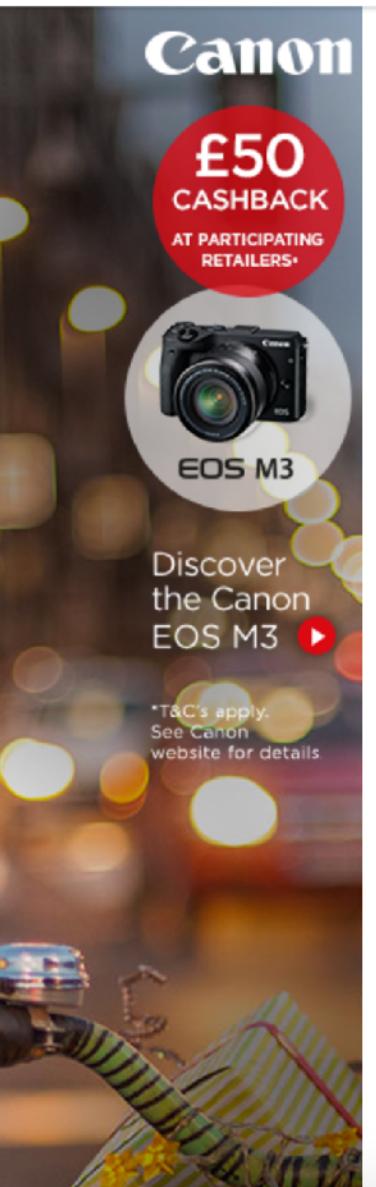


Self driving cars



It is about the Economy





The death of the cabbie? Uber wants to buy 500,000 self-driving cars

CEO wants to hoover up all of its stock

Christopher Hooton | @christophhooton | Wednesday 8 July 2015 | 0 comments



st

Self-driving Uber kills Arizona woman in first fatal crash involving pedestrian

Tempe police said car was in autonomous mode at the time of the crash and that the vehicle hit a woman who later died at a hospital



News

Uber cleared to restart self-driving car testing in California

By Allison Matyus February 6, 2020 2:27PM PST

<https://www.theguardian.co.uk>

<https://www.digitaltrends.com/news/uber-self-driving-testing-california/>

Nah! It will never happen

Robert Thurston, a U.S. steam engine expert, opined in 1894, no less, that horses are not only "self-feeding, self-controlling, self-maintaining and self-reproducing, but they are far more economical in the energy they are able to develop from a given weight of fuel material, than any other existing form of motor."

Car propaganda also portrayed the horse as "untamable beast" and author of "frightful accidents." At the same time motor enthusiasts railed against regulations, speed limits and licensing requirement for new fangled jalopies.

In the end the removal of the horse from urban life and later the farm became a protracted drama that took more than 50 years. It also required the messy adoption of three fossil-fuel technologies.

CNET › Sci-Tech › How self-driving cars will cut accidents 90 percent (Q&A)

How self-driving cars will cut accidents 90 percent (Q&A)

For Road Trip 2015, CNET talks with the University of Michigan's Peter Sweatman about the rapid merging of computers and cars, and the fake city in Ann Arbor where it's being put to the test.



Sci-Tech



by Stephen Shankland

ANN ARBOR, Michigan -- Peter Sweatman isn't in charge of the computing revolution that's sweeping the auto industry, but he's at the center of it.

As director of the [University of Michigan's Transportation Research Institute \(UMTRI\)](#) in



It is about Education



GlobeNewswire

Global Kids Tablet Market Will Reach USD 36.89 Billion By 2027: Zion Market Research

According to the report, the global kids tablet market was USD 9.54 billion in 2018 and is expected to generate USD 36.89 billion by 2027, at a CAGR of 16.2% between 2019 and 2027.

f [Twitter](#) [LinkedIn](#) [Google+](#) [Pinterest](#) | @ Email | Print Friendly | Share

July 04, 2019 09:01 ET | Source: Zion Market Research



Wii are getting fitter: Retirement home installs computer game to keep residents trim

Last updated at 17:38 13 September 2007

Young-at-heart pensioners bored of bowls and bridge have started videogame competitions against each other at their retirement home.

Senior citizens at the Sunrise Home in Birmingham have ditched their zimmerframes because they're hooked on the Nintendo Wii games console.

Pensioners as old as 103 have been joining in the fun on the best-selling console, where gamers use a motion-sensitive controller to mimic sports like tennis, bowling, and boxing.

Residents have been pitting themselves against each other and games have become "competitive" since a Sunrise chef brought the console into the retirement home.

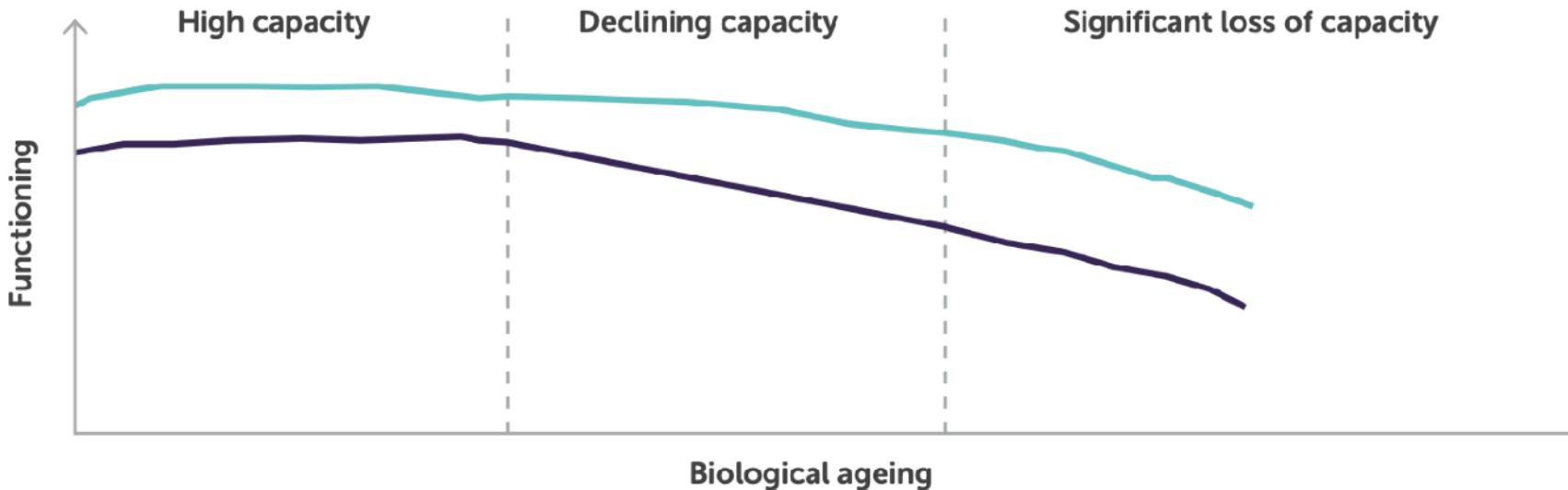
Scroll down for more...



© NEWSTEAM



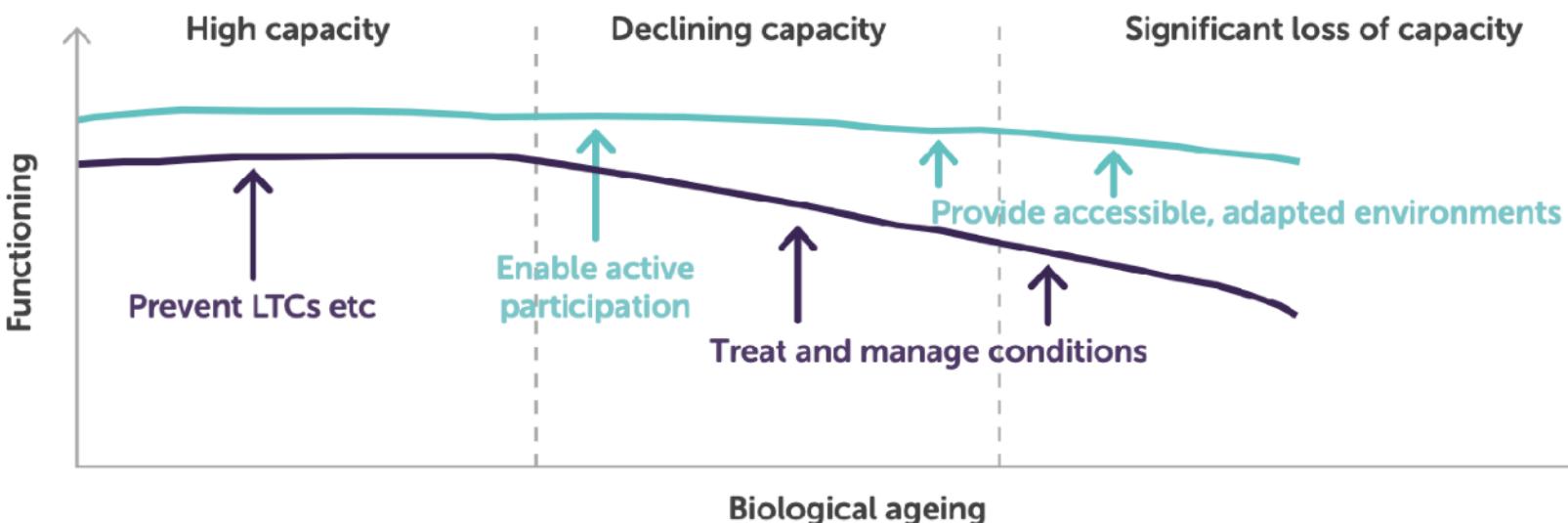
STEPHEN POND



Additional benefits from supportive environments

— Functional ability — Intrinsic capacity

Healthy Ageing



Additional benefits from supportive environments

— Functional ability — Intrinsic capacity

- Although we have experienced a huge increase in life expectancy,
 - a significant proportion of those extra years are spent in poor health.
- In 2018 the Prime Minister announced a mission to
 - “ensure that people can enjoy at least five extra healthy, independent years of life by 2035,
 - while narrowing the gap between the experience of the richest and poorest”

Today, men aged 65 can expect to live another 19 years, but only 10 of those will be spent in good health. Women aged 65 can expect to live another 21 years, but only 11 will be spent in good health (ONS, 2017). In addition, there are significant inequalities in healthy life expectancy, with people in lower socio-economic groups developing long-term conditions at younger ages and spending a larger proportion of their later life in poor health.

There are significant opportunities for innovation across the whole spectrum of prevention, management, mitigation and adaptation. However, the private sector has been slow to respond. Despite people aged 50 and over holding an estimated 77% of the UK's financial wealth in 2014 (Centre for Economics & Business Research, 2015), there is a dearth of products and services in the market that meet the desires and aspirations, as well as the needs, of an older population.

<https://www.ageing-better.org.uk/publications/industrial-strategy-challenge-fund-healthy-ageing-framework>

Need for Healthy Ageing

III-Health Impacts business and society

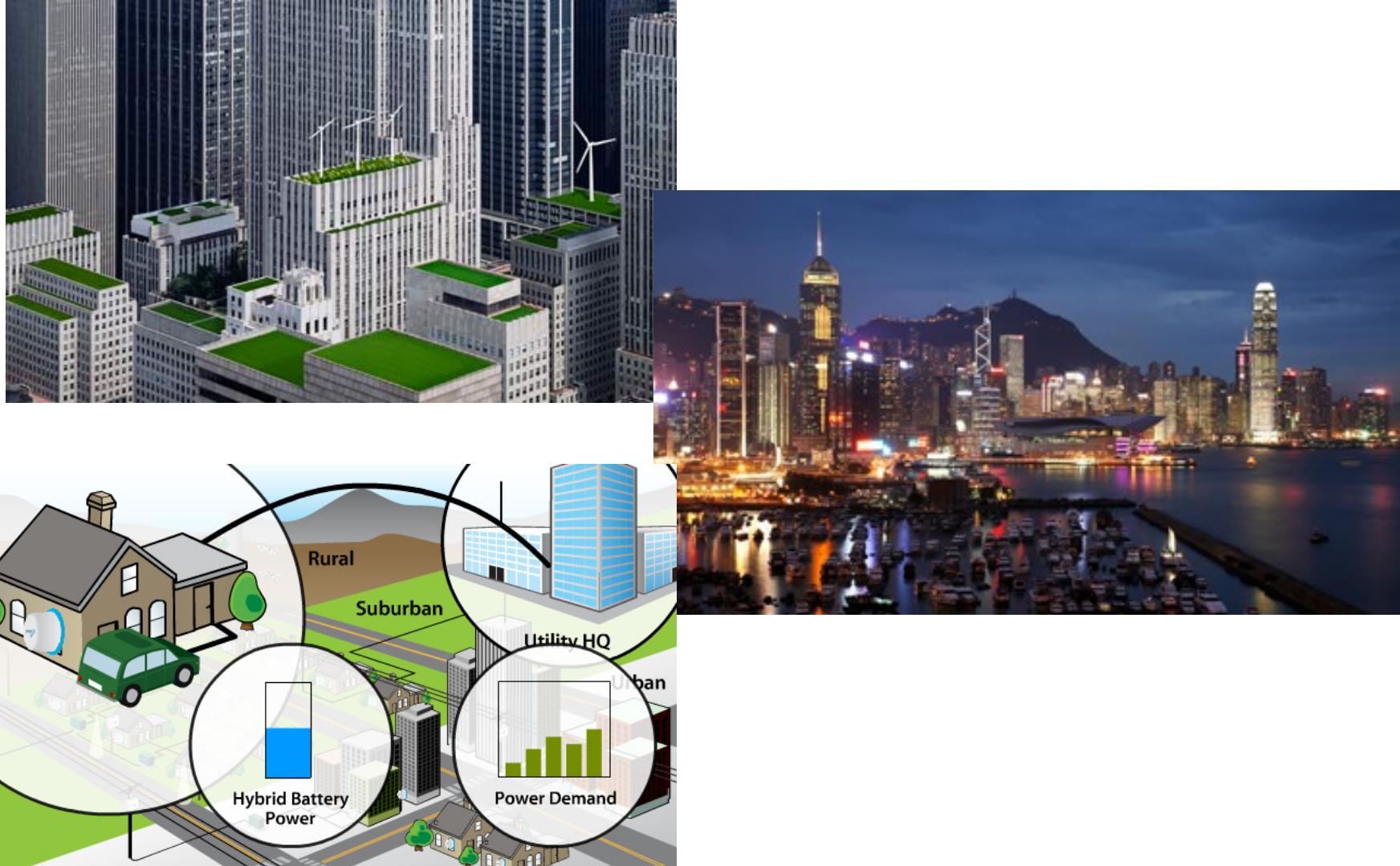
- Combined costs to the UK economy of worklessness and sickness absence: over £100B annually
 - £1B annually in Sheffield.
- Cost of poor mental health to local employers: £420M a year.
- 30% of the gap in productivity between North and South is attributable to the health gap.
 - 2/3 Sheffield adults are overweight or obese.
 - At least 4 in 10 are inactive
 - This impacts on cancer, CVD, MSK, etc.
- 10% reduction in long term conditions for working aged people can decrease economic inactivity by 3% (NHSA 2018)

Healthy Ageing in the workforce is key

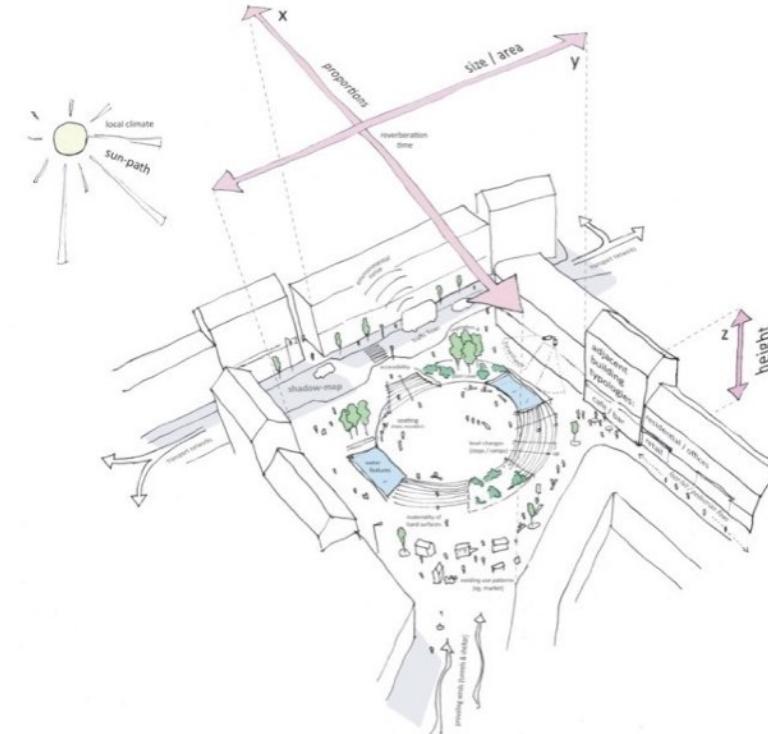
- ▶ Poor Health is the key contributor to forced early retirement (Marvell & Cox, 2017)
- ▶ An ageing UK population will escalate costs and benefits - (20m over 65s by 2066, ONS)
- ▶ Workplace Health Programmes (WHP) improve productivity but few use them
- ▶ Current solutions are not designed for 50+ users & lack 'sticky' user design & proven ROI
- ▶ Changing behaviour requires integrated solutions at every point of food choice

Source Sheffield City Council

It is about Urban Spaces



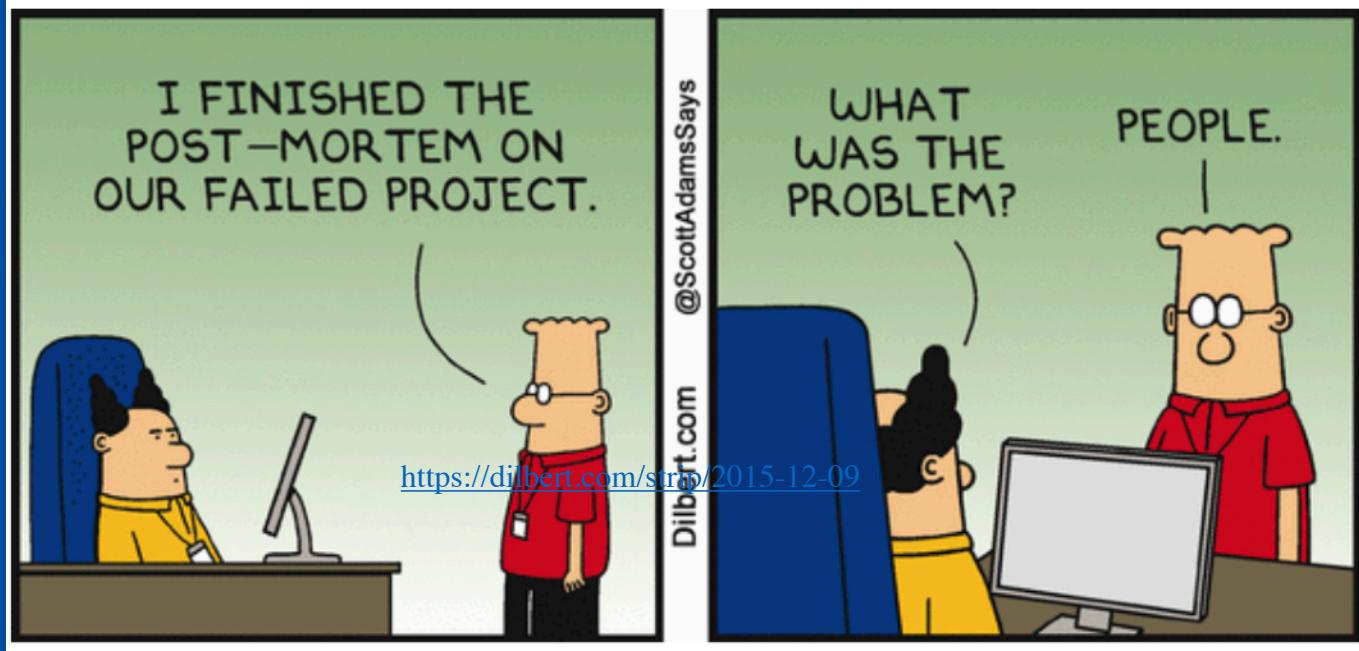
It is about Arts and Humanities



Pesky Humans in the Loop



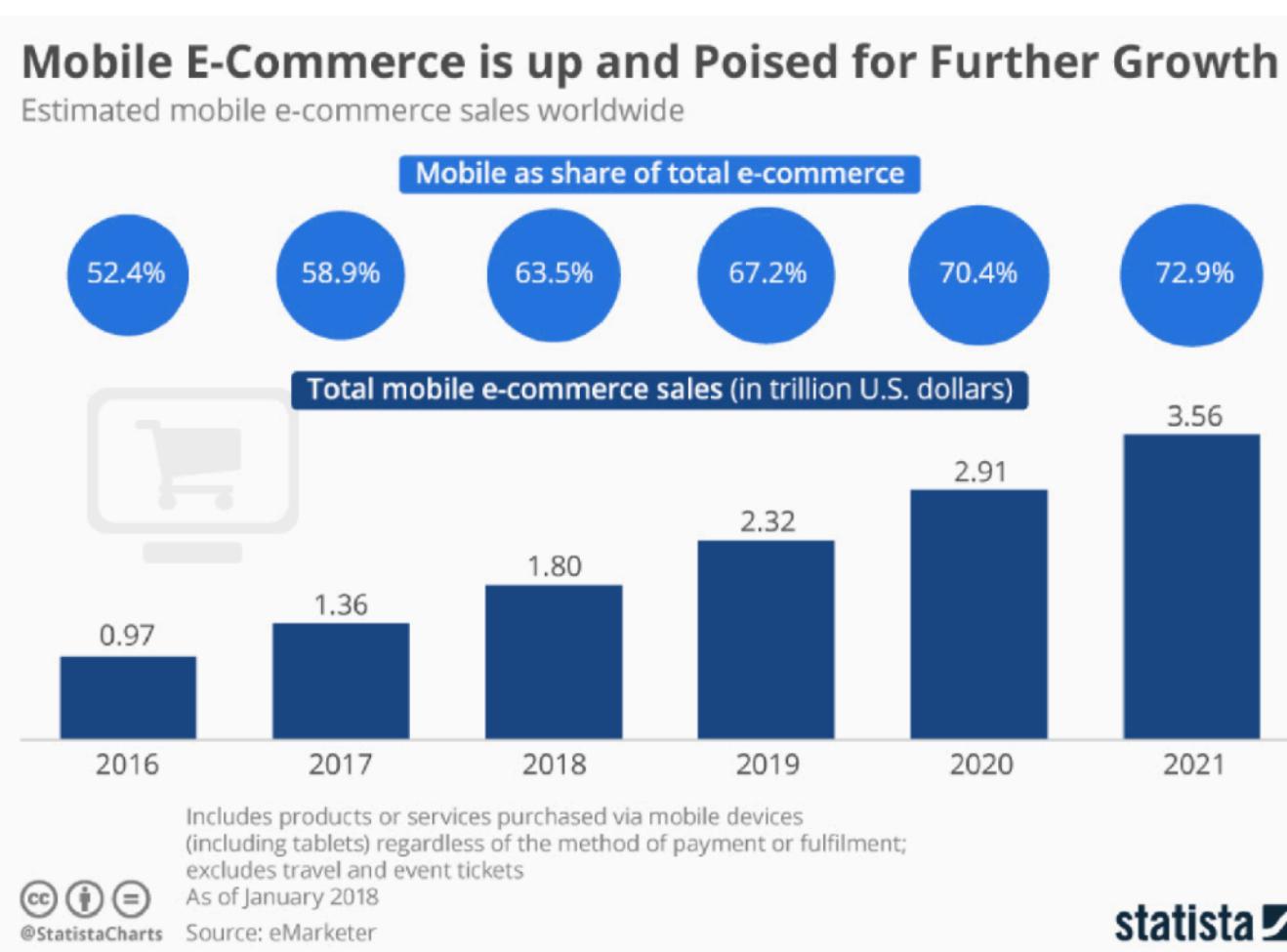
Wednesday December 09, 2015 *The Problem Is People*



Mobile first

- Mobile devices are the main way for people to be online

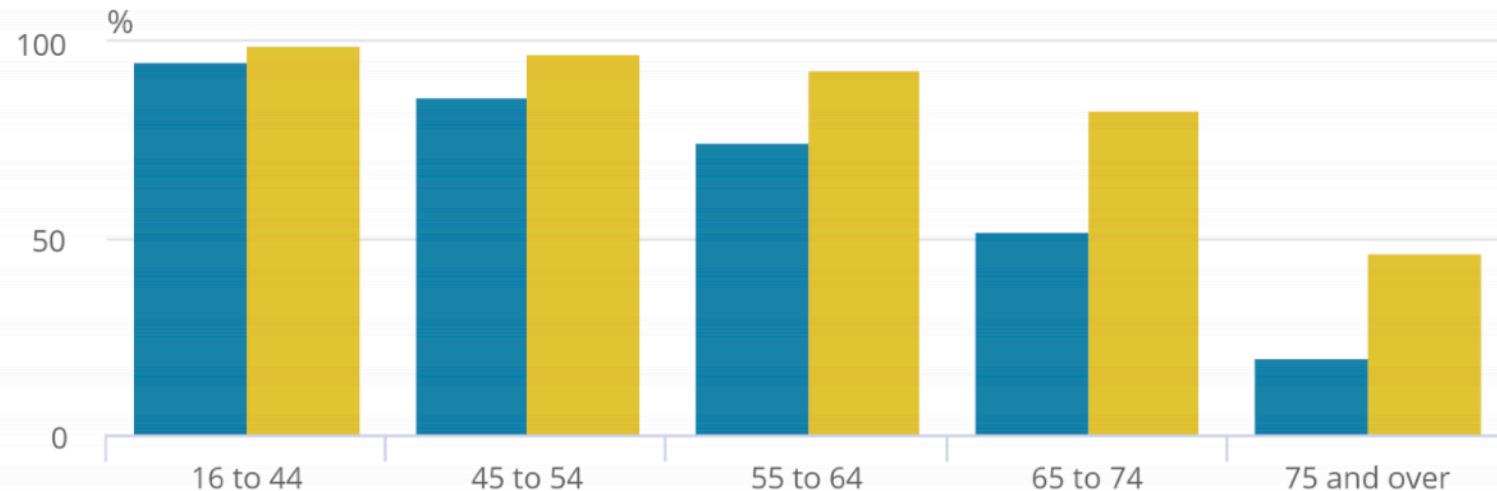
-



What demographics?

Figure 1: Since 2011, the 65 to 74 years age group has seen the largest increase in recent internet use

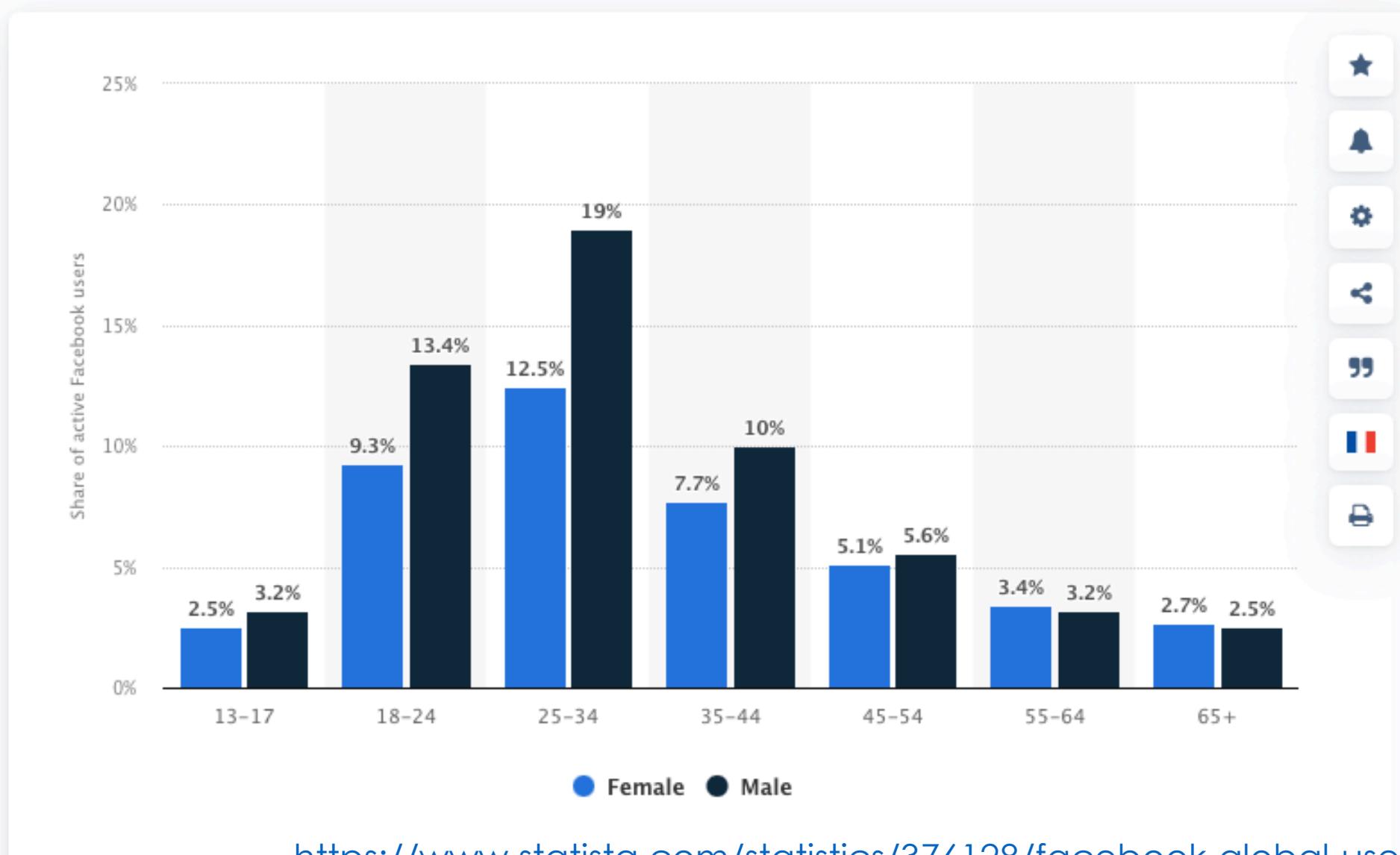
Recent internet users, UK, 2011 and 2019



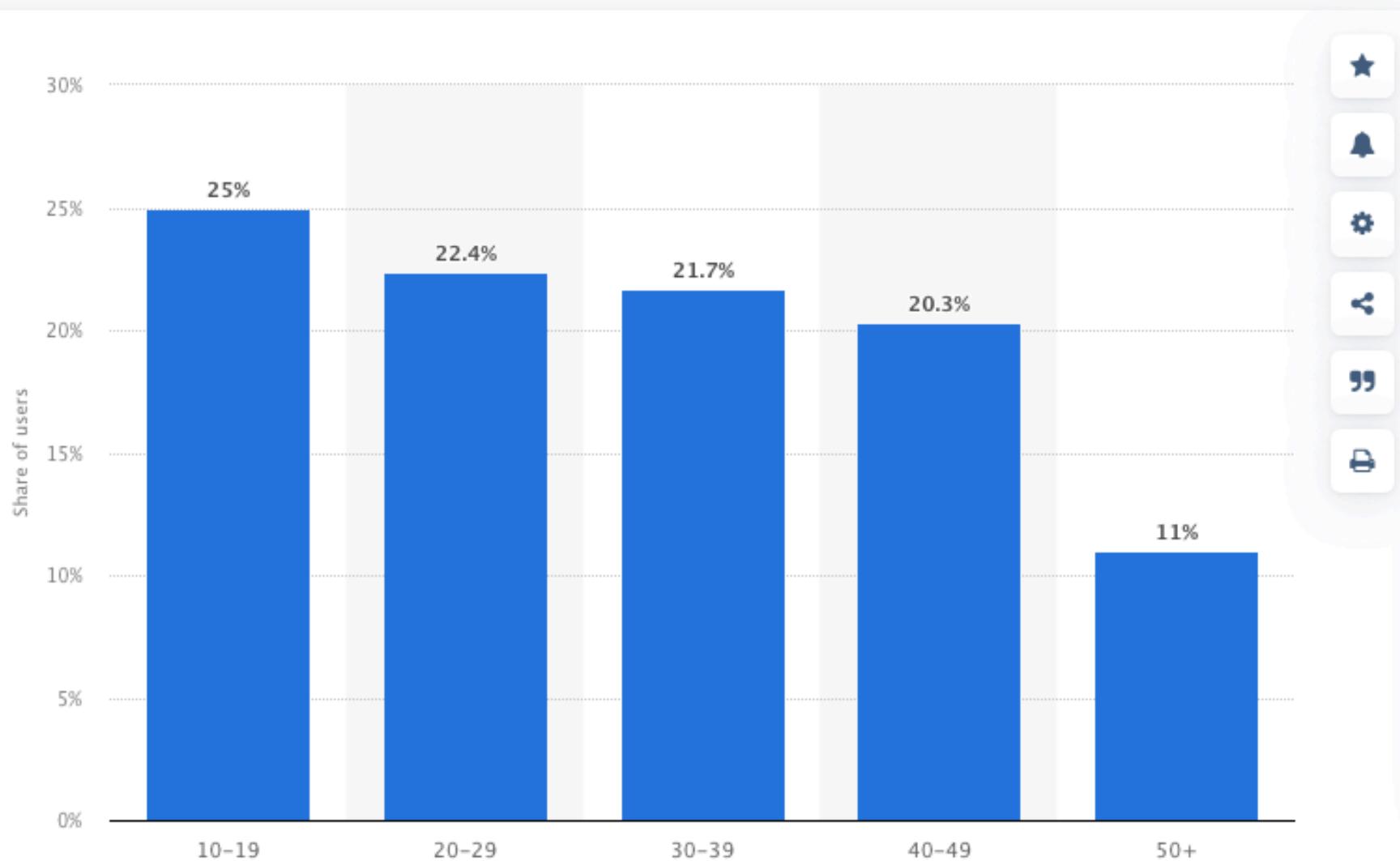
<file:///Users/fabio/Downloads/Internet%20users.%20UK%202019.pdf>

Who are you designing your technologies for?

Distribution of Facebook users worldwide as of October 2021



Distribution of TikTok users in the United States as of September 2021



Broadband Penetration

Country or area	Fixed-broadband subscriptions				Mobile-cellular subscriptions			
	Number ^[7]	Rank	Subscriptions per 100 individuals ^[8]	Rank	Number ^[9]	Rank	Subscriptions per 100 individuals ^[10]	Rank
-China	378,540,000	1	26.86	43	1,474,097,000	1	104.58	105
-United States	109,838,000	2	33.85	24	395,881,000	4	122.01	65
-Japan	40,390,640	3	31.68	28	170,128,499	7	133.45	36
-Germany	33,217,000	4	40.45	10	106,000,000	15	129.09	45
-Russian Federation	30,872,788	5	21.44	54	227,341,873	6	157.89	12
-Brazil	28,670,016	6	13.70	74	236,488,548	5	113.00	90
-France	28,429,000	7	43.75	5	69,017,000	22	106.21	99
-United Kingdom	26,015,818	8	39.31	13	79,173,658	20	119.63	74
-South Korea	21,195,918	9	41.58	9	63,658,688	23	124.86	55
-India	17,856,024	10	1.33	126	1,186,902,277	2	87.28	128
-Mexico	17,131,820	11	13.26	75	114,326,842	14	88.51	126
-Italy	16,586,376	12	27.94	39	83,871,543	19	141.29	26
-Spain	14,473,888	13	31.22	30				
-Canada	13,922,504	14	38.01	13				
-Turkey	11,924,905	15	14.77	70				
-Vietnam	11,269,936	16	11.80	8				

South Korea is still number one – has fastest Internet speed worldwide

Posted in Main on January 31st, 2012 by Pingdom

Want to be able to download a DVD worth of data in about 38 minutes? It may not seem very impressive, but that's with the average Internet speed in South Korea, according to the latest "State of the Internet" report by Akamai.

Covering Q3 2011, the report again puts South Korea at the top of the list of countries with the fastest Internet connections. The country scored an average connection speed of 16.7 Mbps in Q3 2011.

[Read more](#) ▾

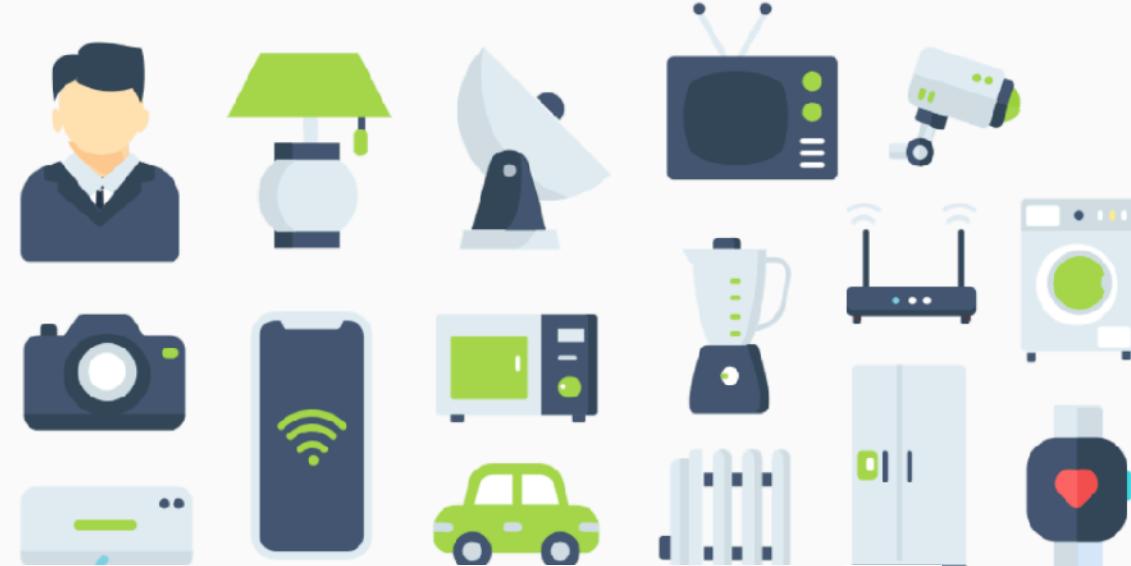


The Devices in the Loop



15

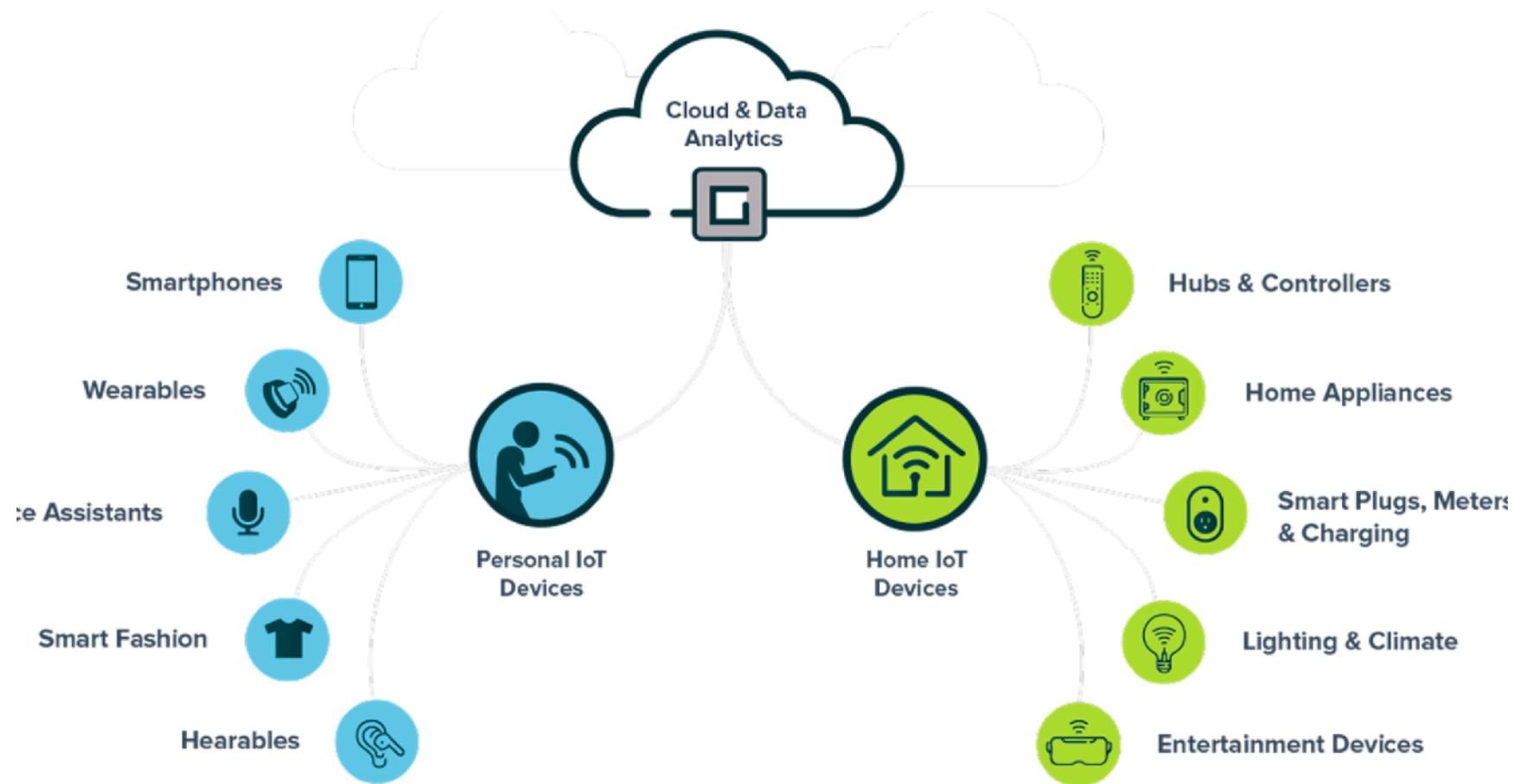
DEVICES
PER PERSON



... which means 15 connected devices per person.

<https://www.reply.com/en/topics/internet-of-things/the-evolution-of-the-consumer-internet-of-things>

IoT space



Scannable

- Another way in into the IoT



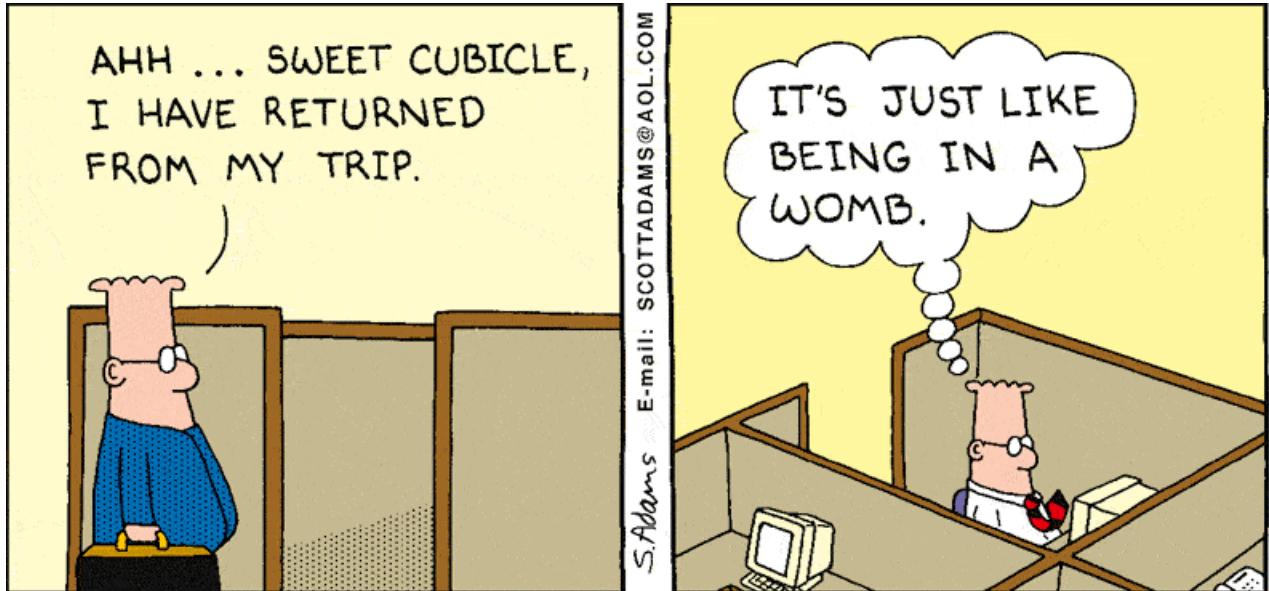
-  Access control
-  Physical Access
-  Cashless payments
-  Targeted marketing
-  Loyalty programs
-  Location-based services
-  Mobile payments
-  In-store marketing

Some People Laugh at Wearables



Some People Laughed at PC & Internet

What about you?



<http://forums.sailinganarchy.com/index.php?/topic/195334-dilbert/>

If you think your job is to be a developer in your cubicle,
Think again

Questions?

