BUSINESS TRENDS

Week 11: The transformative power of technology

Professor: Omar Maguiña Rivero

GLOBAL TURNIGN POINTS

for Business and Society

The Transformative Power of Technology

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Learning Outcome

At the end of the session, the student will describe the current state of the art in a selected industrial sector, and how a specific technology can add value to a company and its customers.


2005
Luca Bruno / AP

NBC/Instagram

Focus On Several Areas

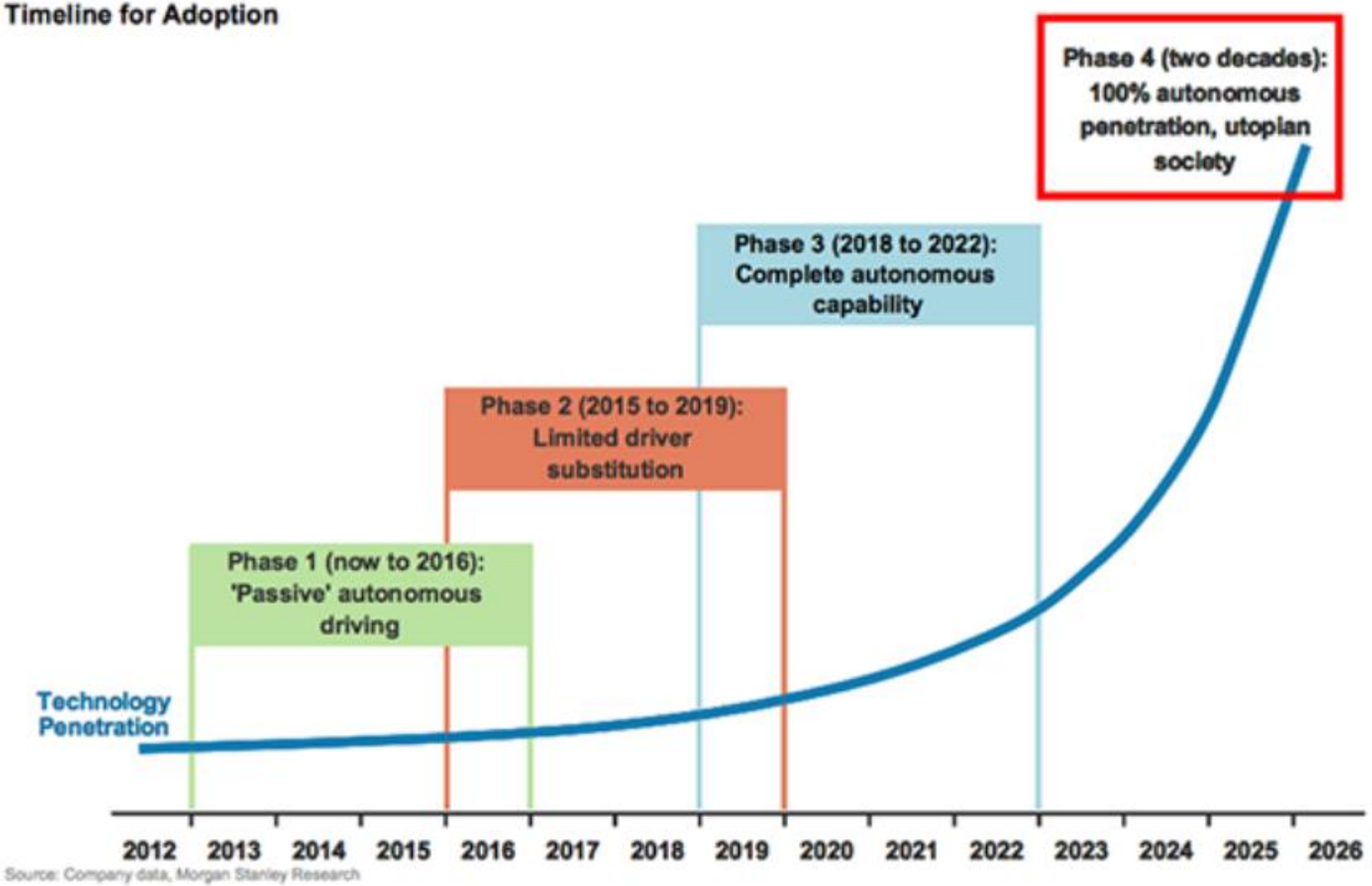
- Robotics / automation (next day of class).
- Driverless vehicles.
- Sharing economy.
- Internet of things.
- Augmented & virtual reality.
- 3D printing.
- Nanotechnologies.
- Big data and computational analysis.
- Blockchain.
- Geography of technological innovation.

Driverless Vehicles

- Population 60+.
- Automated valet service.
- Ethical issues: Do you hit the pedestrian in front of you or the bicycle on the side?

Exhibit 20

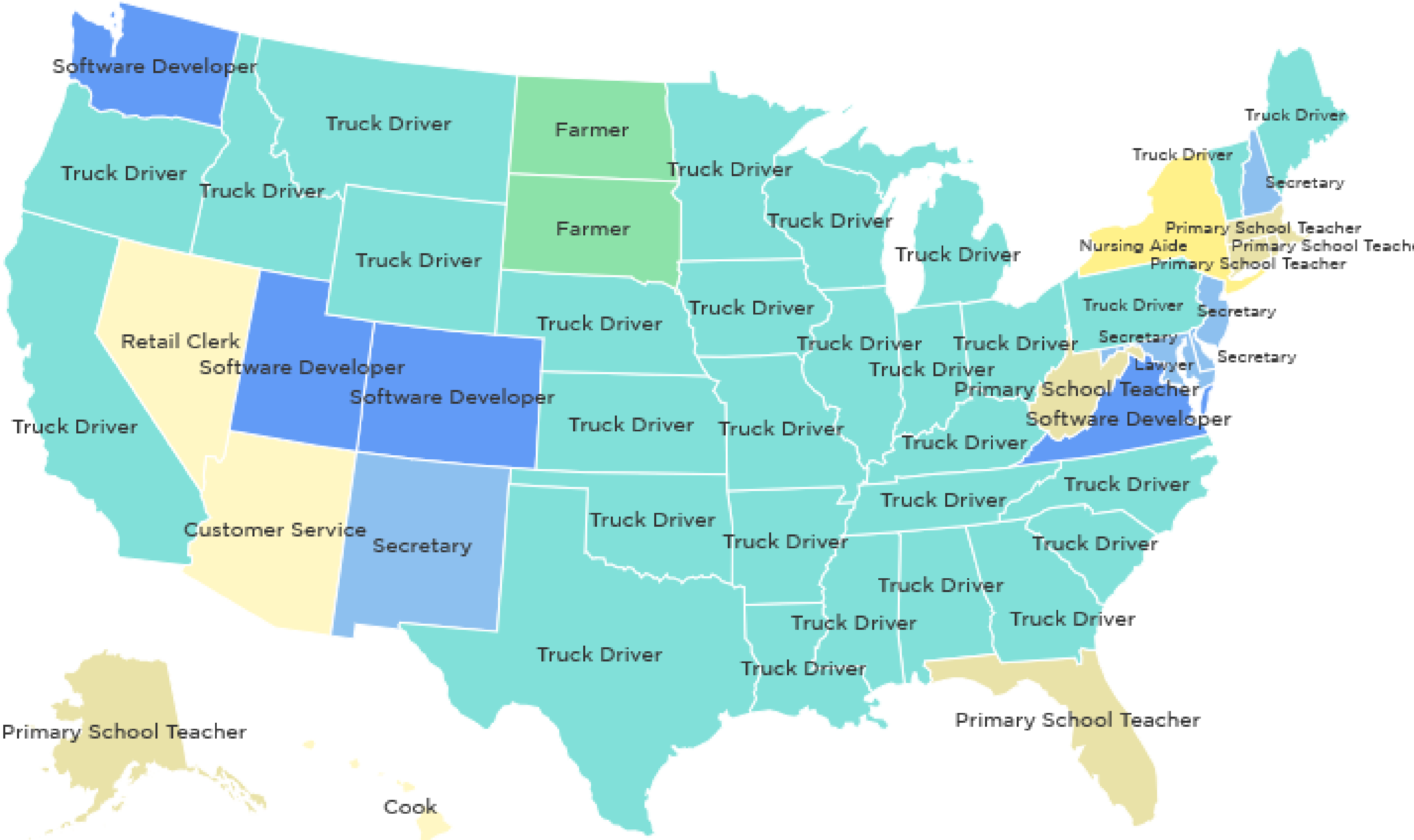
Timeline for Adoption



Source: Company data, Morgan Stanley Research

Source: https://medium.com/basic-income/self-driving-trucks-are-going-to-hit-us-like-a-human-driven-truck-b8507d9c5961#.y15xaqxnq

Largest Occupation By State

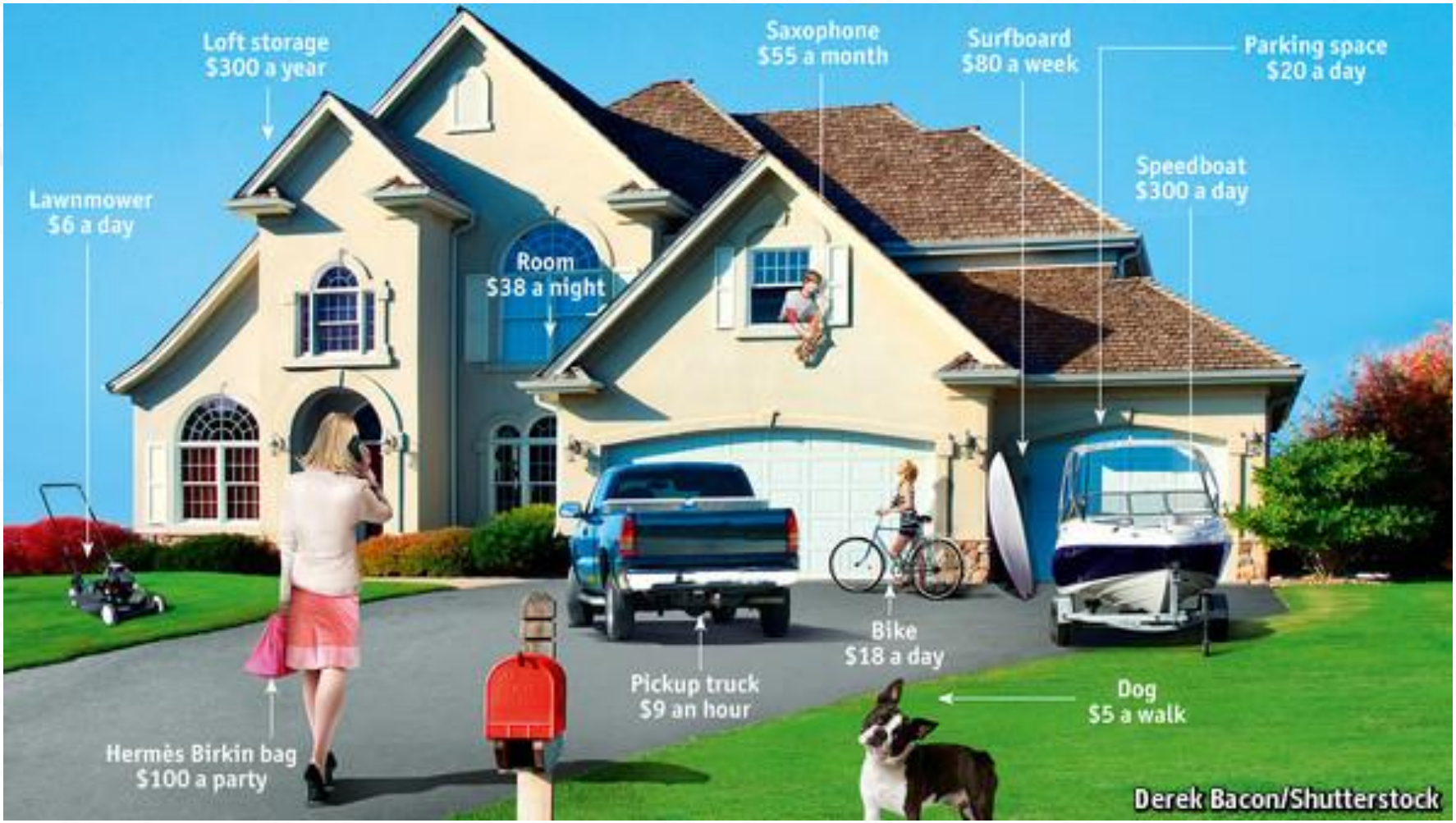


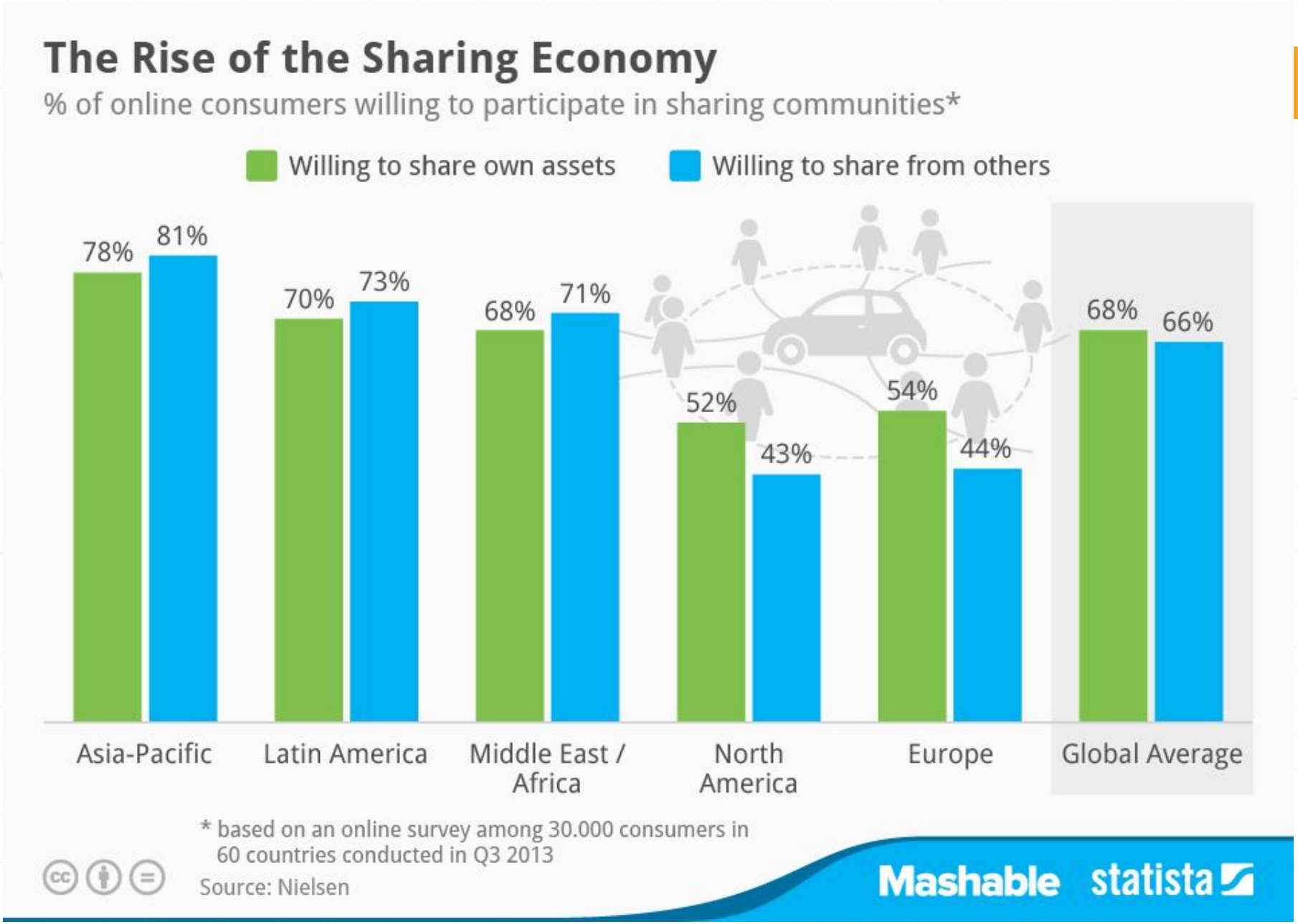
Source: https://medium.com/basic-income/self-driving-trucks-are-going-to-hit-us-like-a-human-driven-truck-b8507d9c5961#.y15xaqxnq

Occupation	# Total Jobs (BLS, May 2015)	Range of Replacement Weights	Range of # Jobs Threatened
Bus Drivers, Transit and Intercity	168,620	0.60 – 1.0	101,170 – 168,620
Light Truck or Delivery Services Drivers	826,510	0.20 – 0.60	165,300 – 495,910
Heavy and Tractor-Trailer Truck Drivers	1,678,280	0.80 – 1.0	1,342,620 – 1,678,280
Bus Drivers, School or Special Client	505,560	0.30– 0.40	151,670 – 202,220
Taxi Drivers and Chauffeurs	180,960	0.60 – 1.0	108,580 – 180,960
Self-employed drivers	364,000	0.90 – 1.0	328,000 – 364,000
TOTAL JOBS	3,723,930		2,196,940 – 3,089,990

Source: Executive Office of the President, *Artificial Intelligence, Automation, and the Economy* (December 2016).

The Sharing Economy

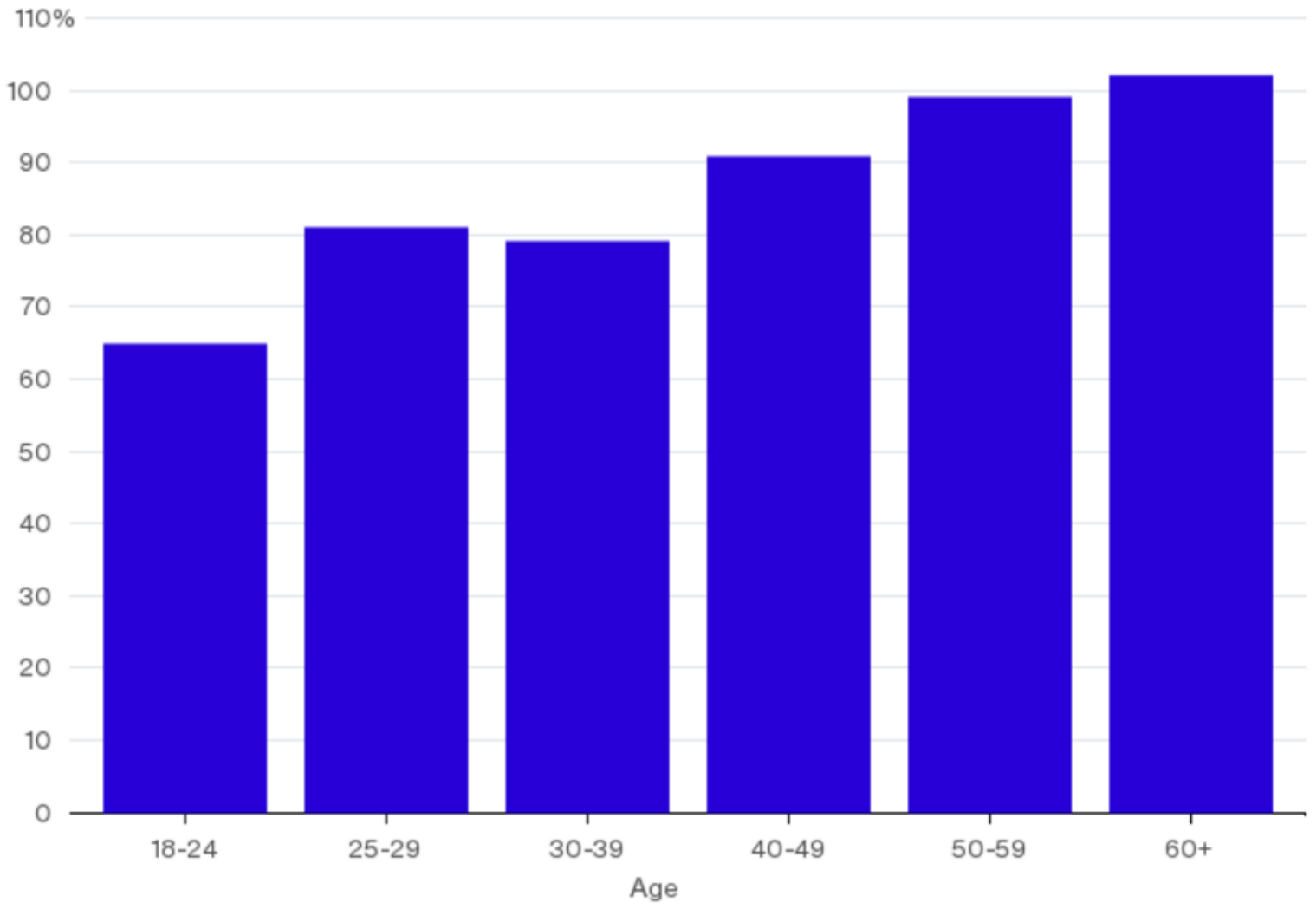




Source: https://www.statista.com/chart/2323/the-rise-of-the-sharing-economy/

Airbnb's Fastest-Growing Age Group: People 60 and Older

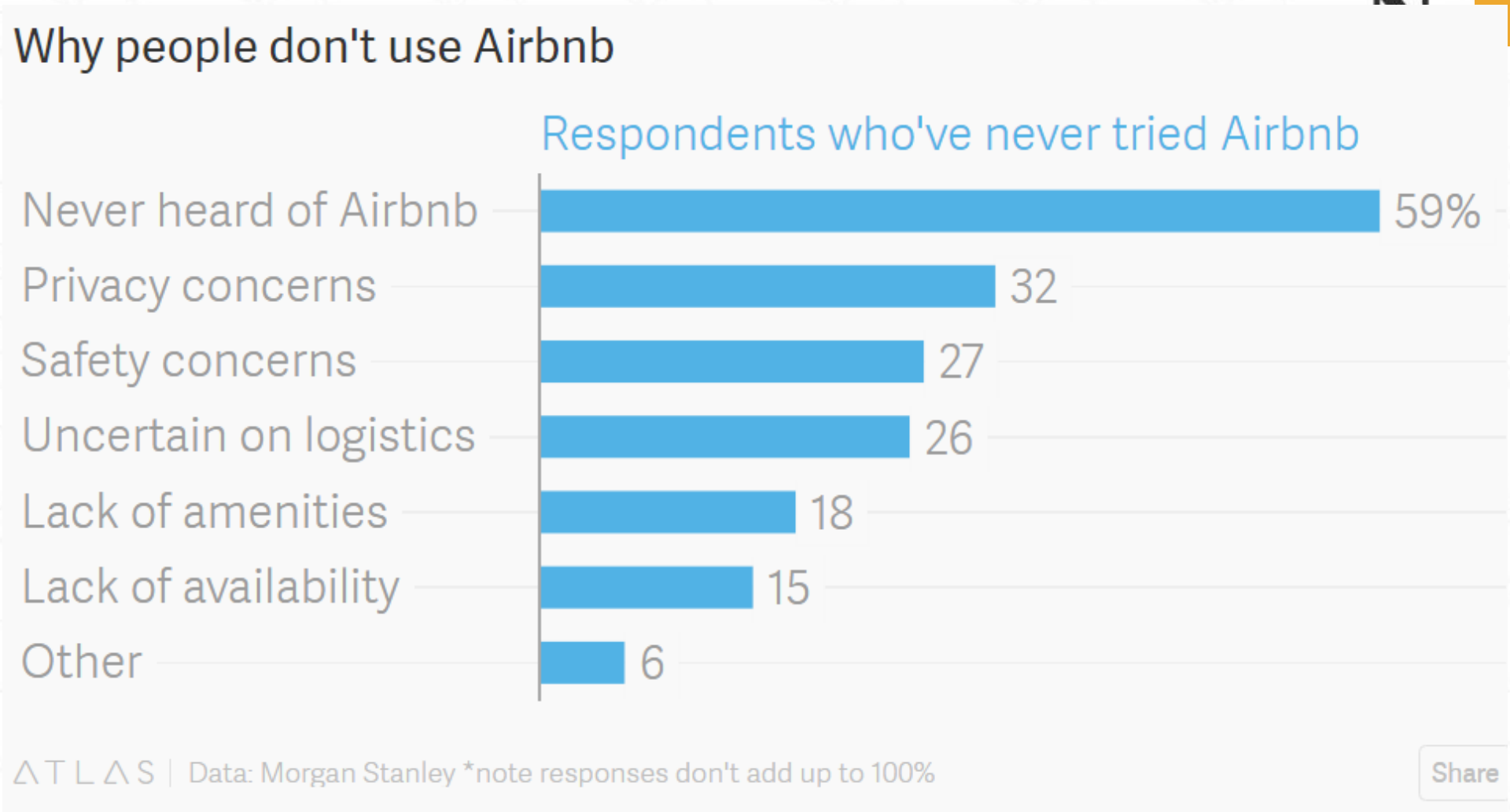
Year-over-year percentage growth in the number of hosts by age range on Airbnb.



Source: Airbnb

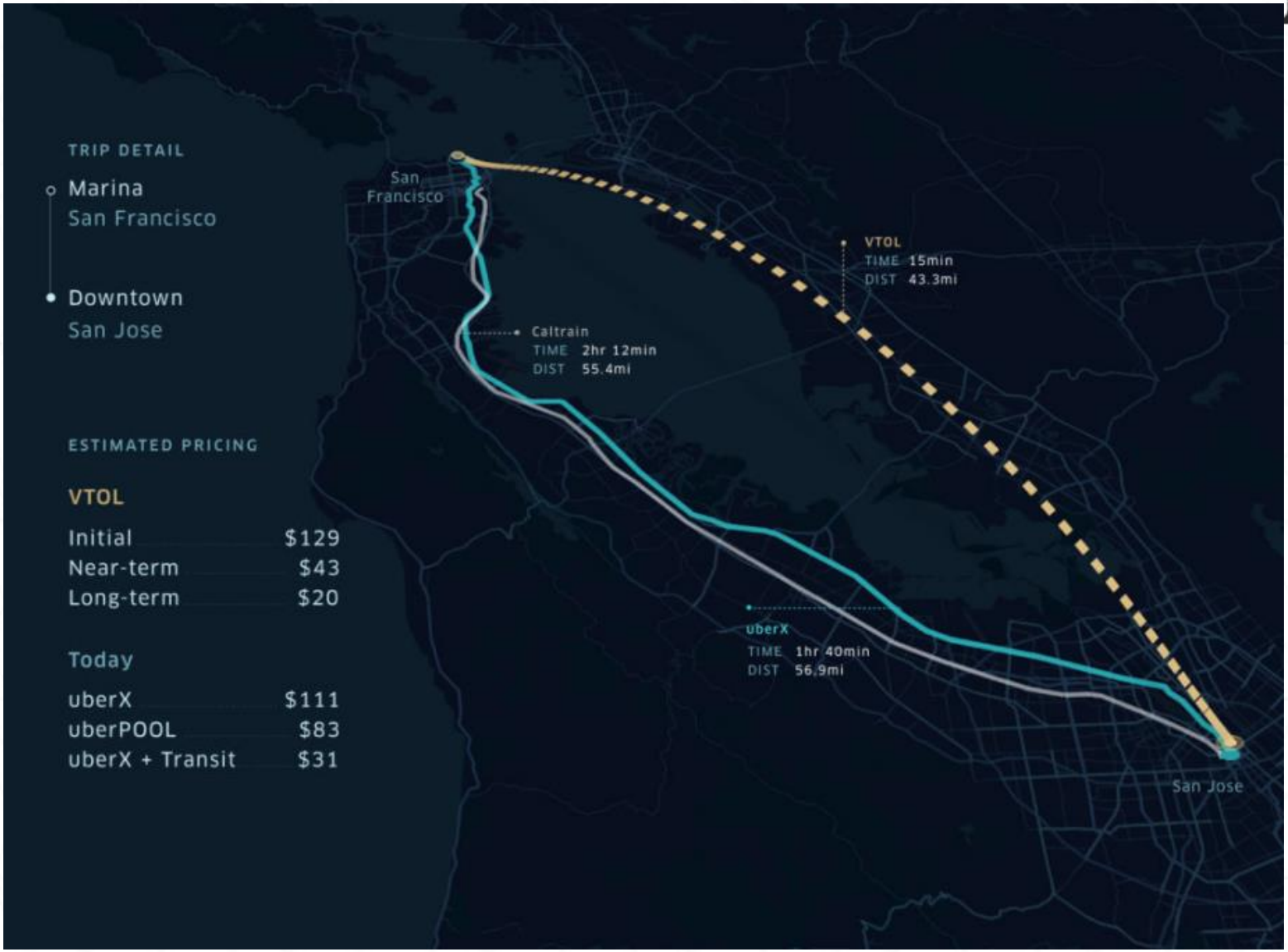
Bloomberg

Source: https://www.bloomberg.com/technology



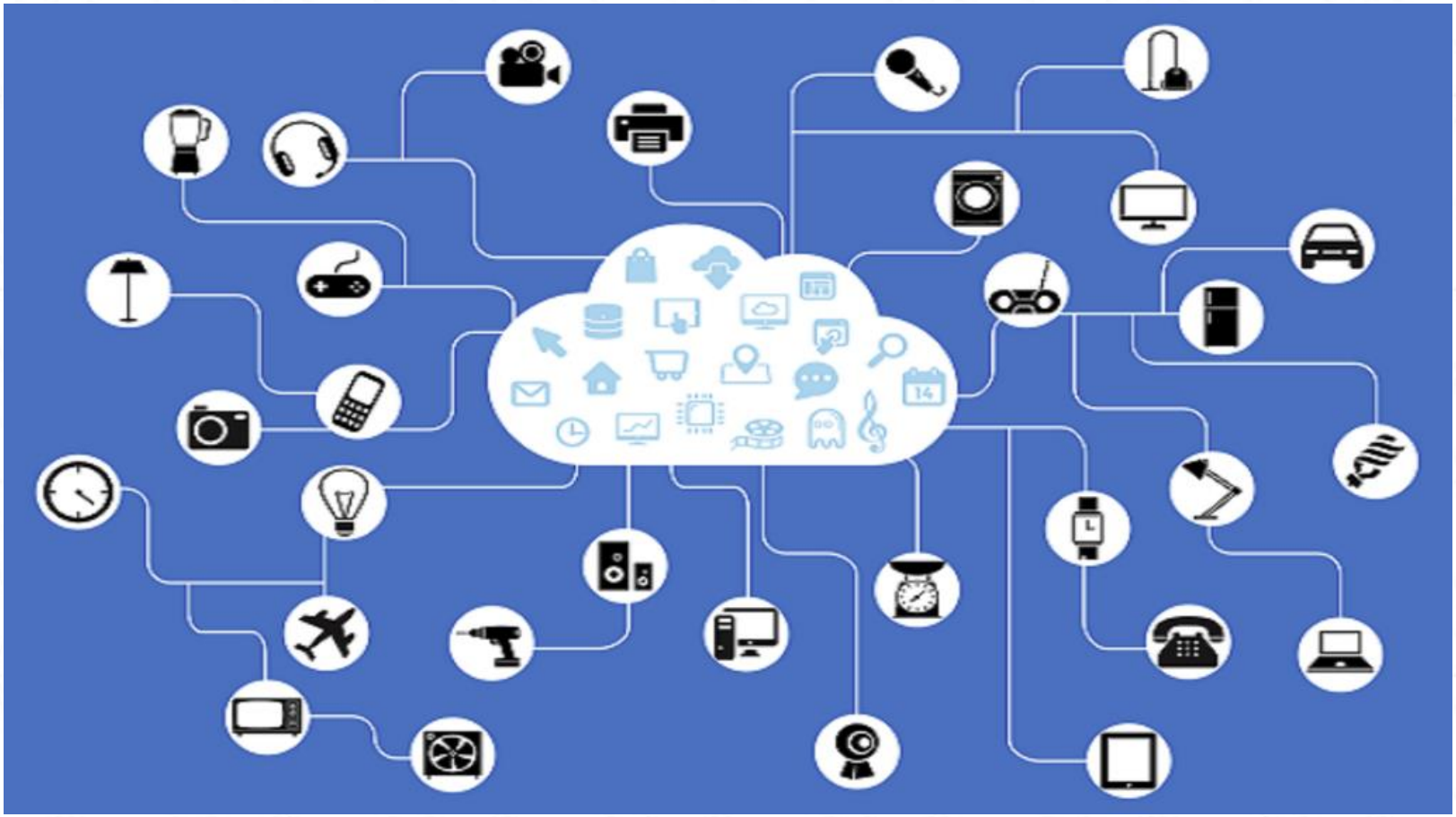
Source: http://qz.com/551612/why-the-hotel-industry-isnt-afraid-of-airbnb-yet-explained-in-five-charts/

Uber's On-demand Air Service

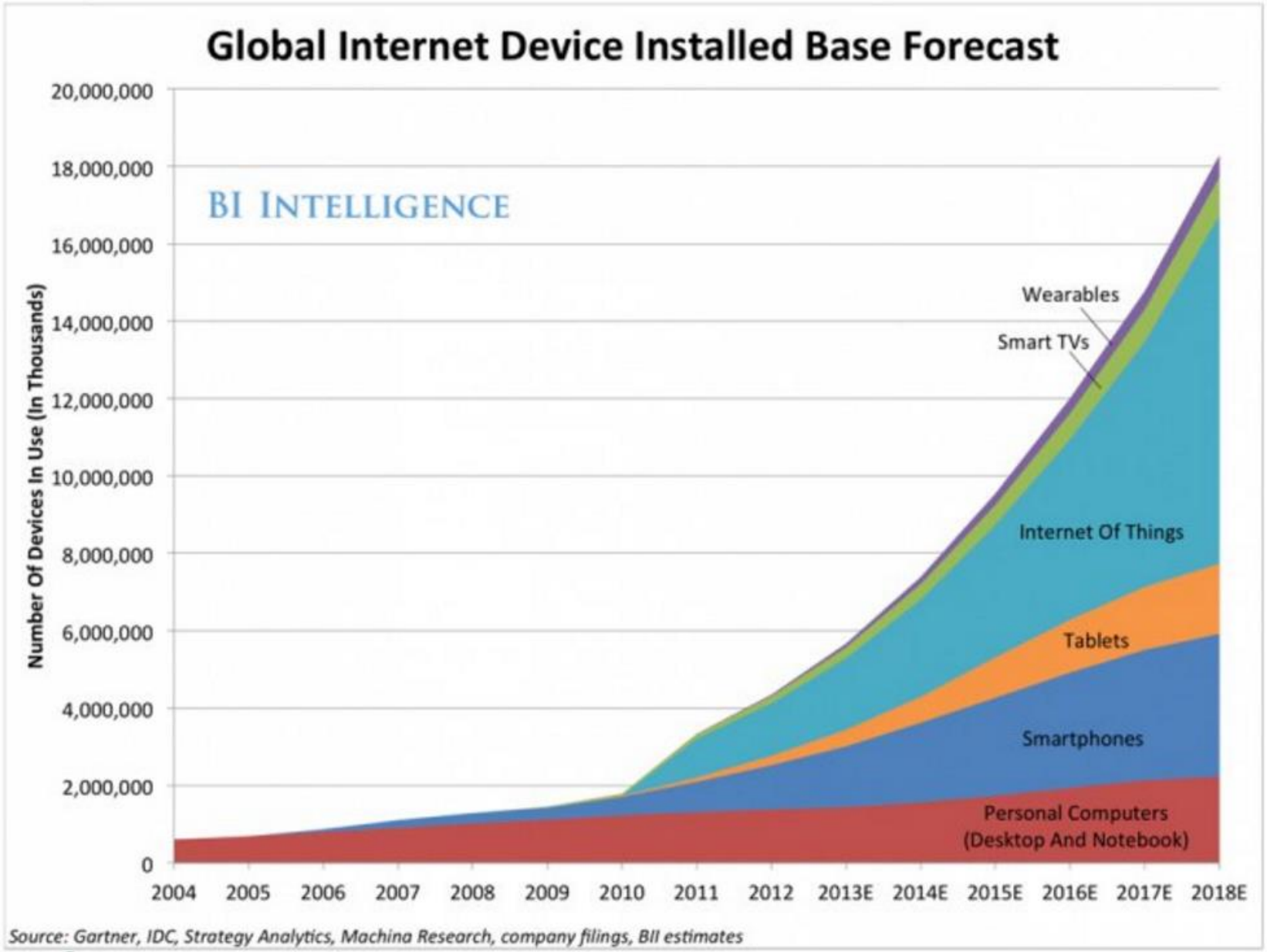


Source: https://www.wired.com/2016/10/uber-flying-cars-elevate-plan/

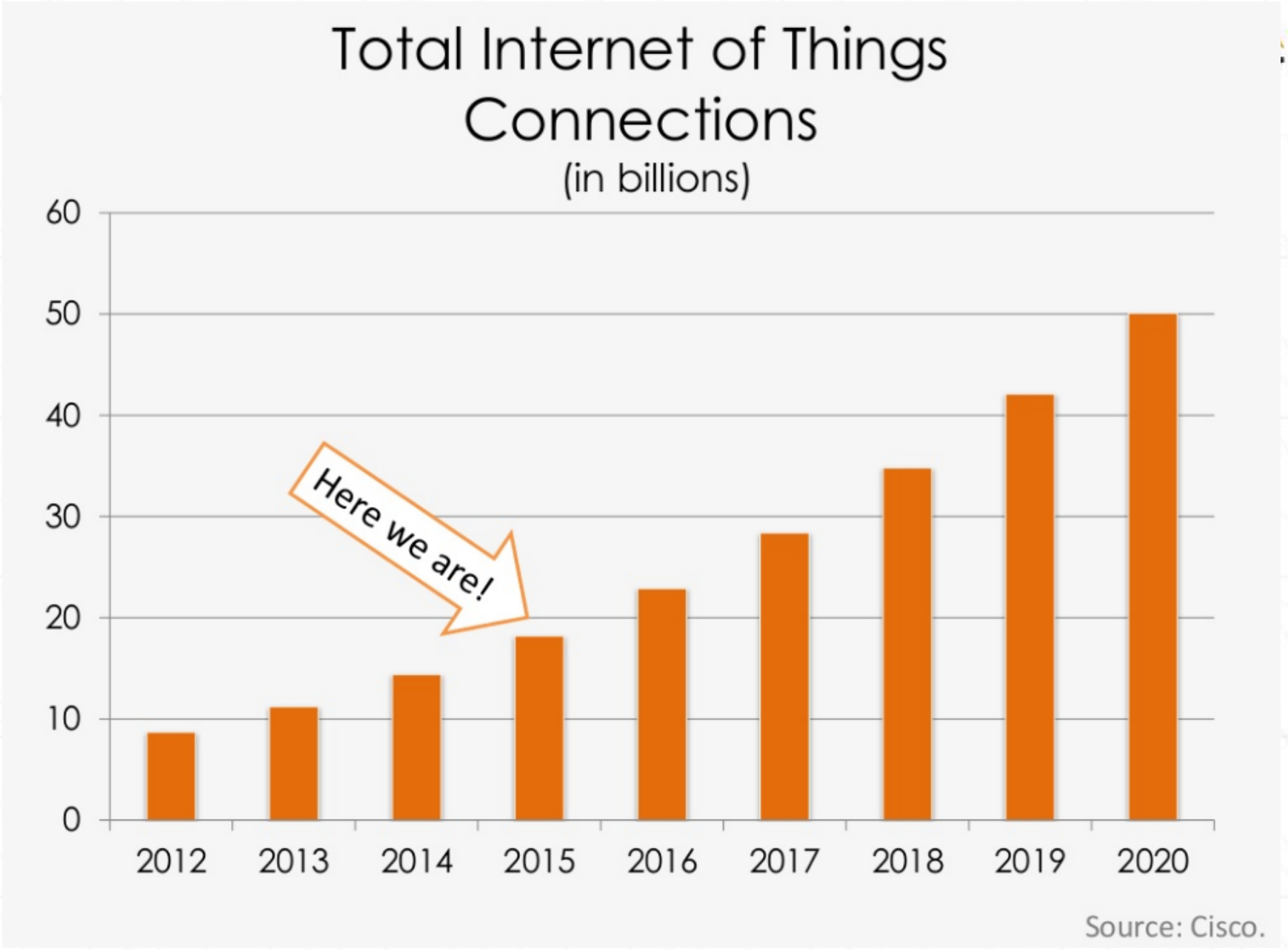
The Internet Of Things



Source: https://digitalcontentnext.org/blog/2015/10/13/exploring-the-internet-of-things-in-5-charts/

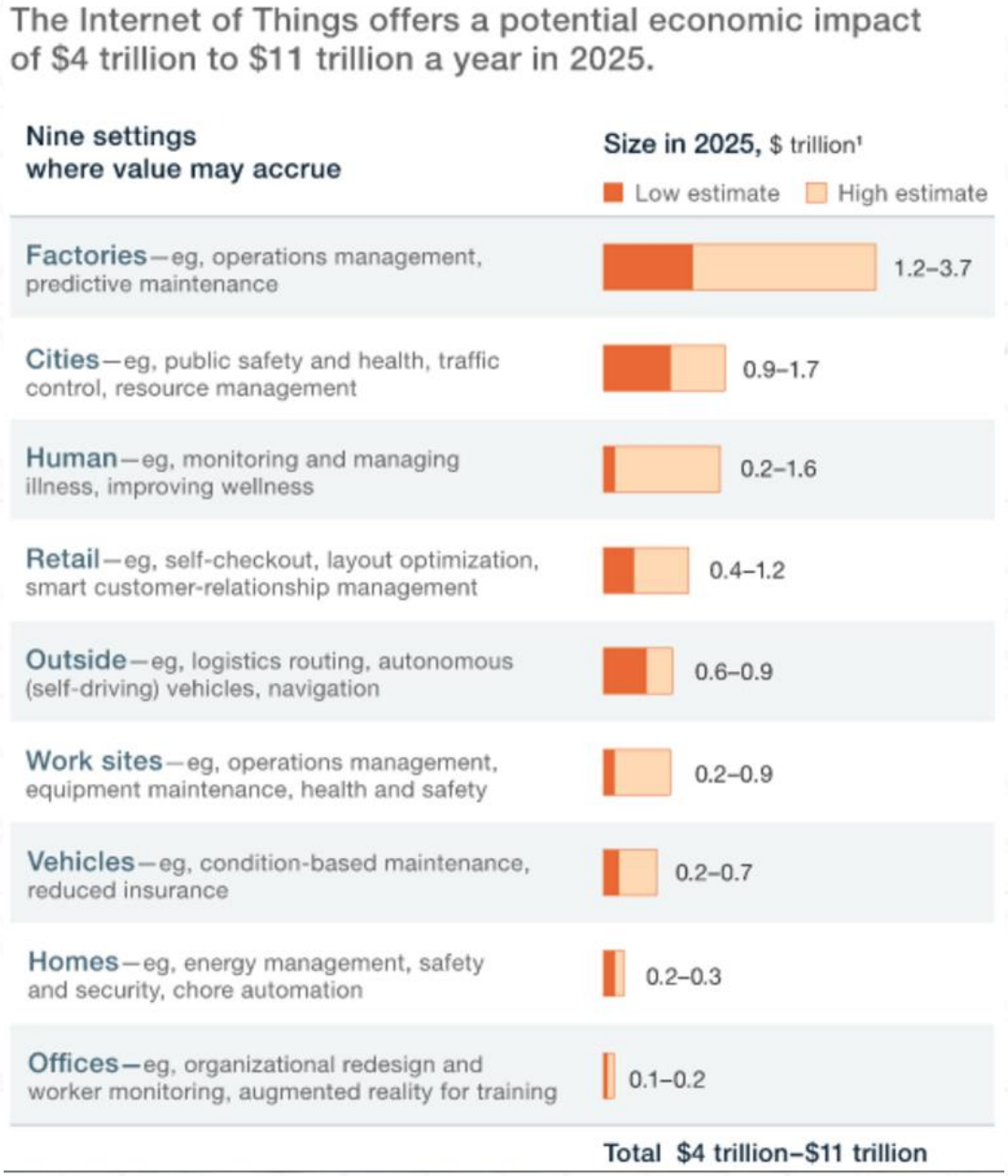


Source: https://digitalcontentnext.org/blog/2015/10/13/exploring-the-internet-of-things-in-5-charts/

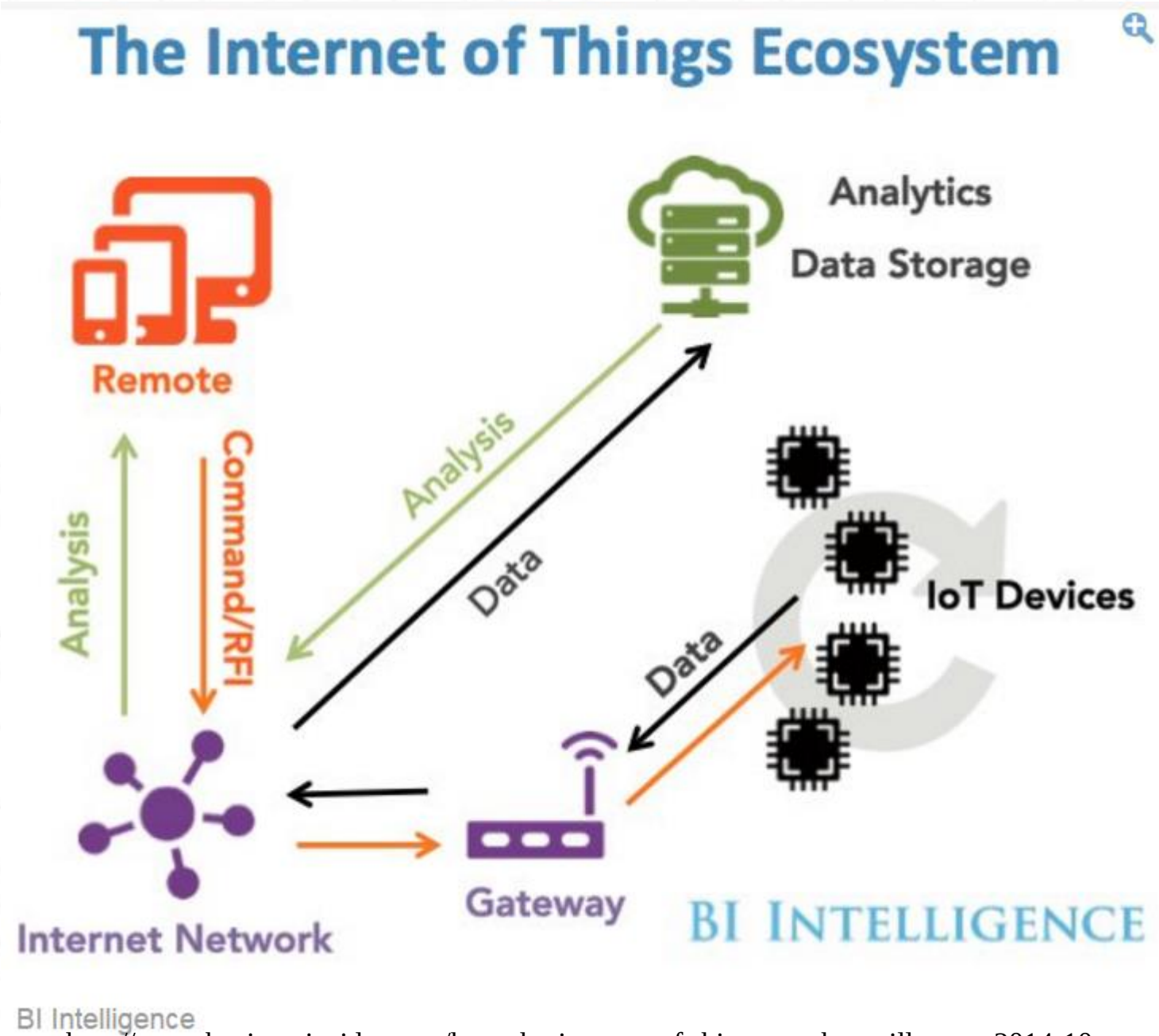


Source: http://www.fool.com/investing/general/2015/02/12/the-internet-of-things-in-4-charts.aspx

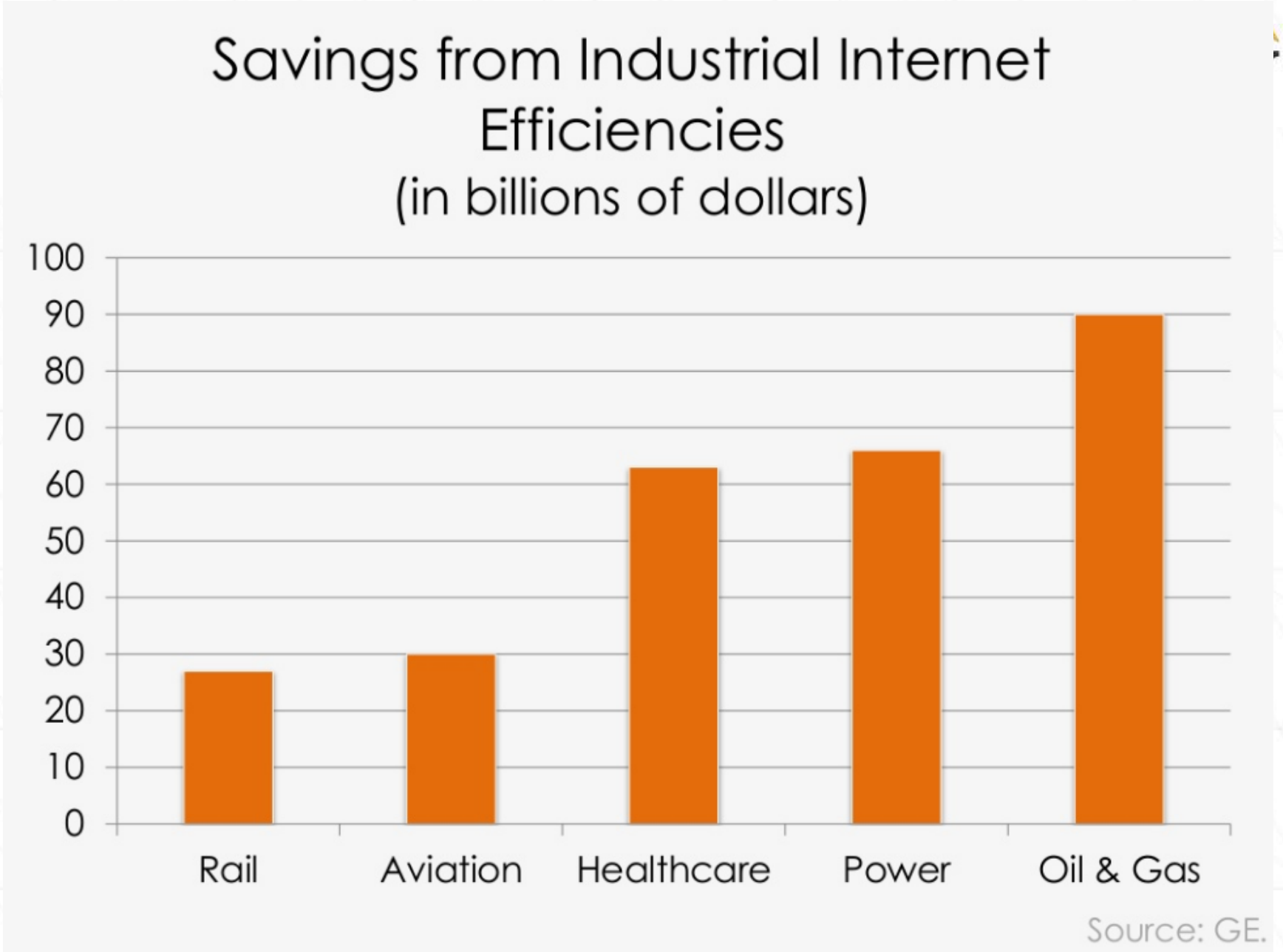
CATEGORY	2013	2014	2015	2020
AUTOMOTIVE	96.0	189.6	372.3	3,511.1
CONSUMER	1,842.1	2,244.5	2,874.9	13,172.5
GENERIC BUSINESS	395.2	479.4	623.9	5,158.6
VERTICAL BUSINESS	698.7	836.5	1,009.4	31,164.4
GRAND TOTAL	**3,032.0**	**3,750.0**	**4,880.6**	**25,006.6**



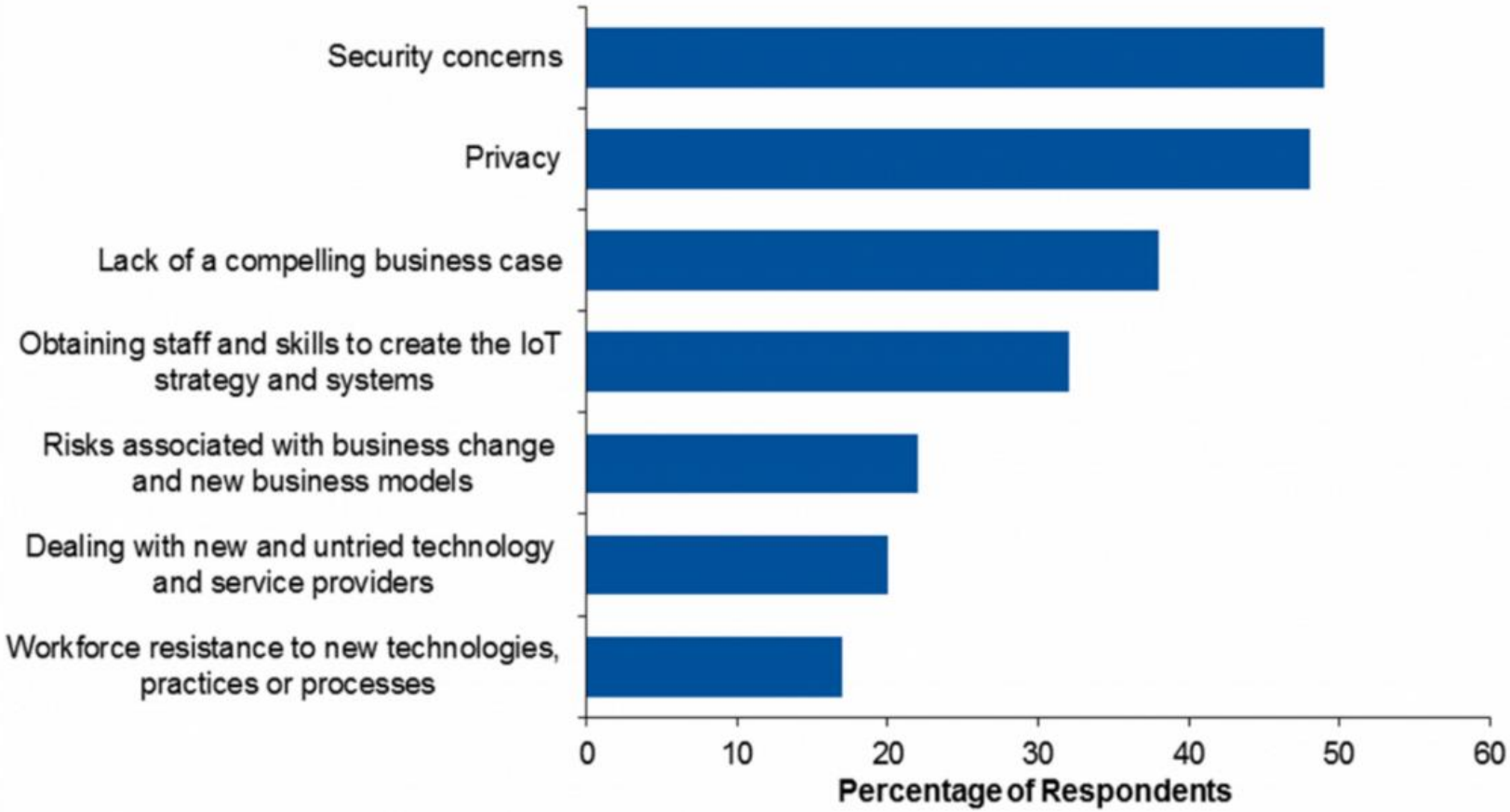
Source: https://digitalcontentnext.org/blog/2015/10/13/exploring-the-internet-of-things-in-5-charts/



Source: http://www.businessinsider.com/how-the-internet-of-things-market-will-grow-2014-10



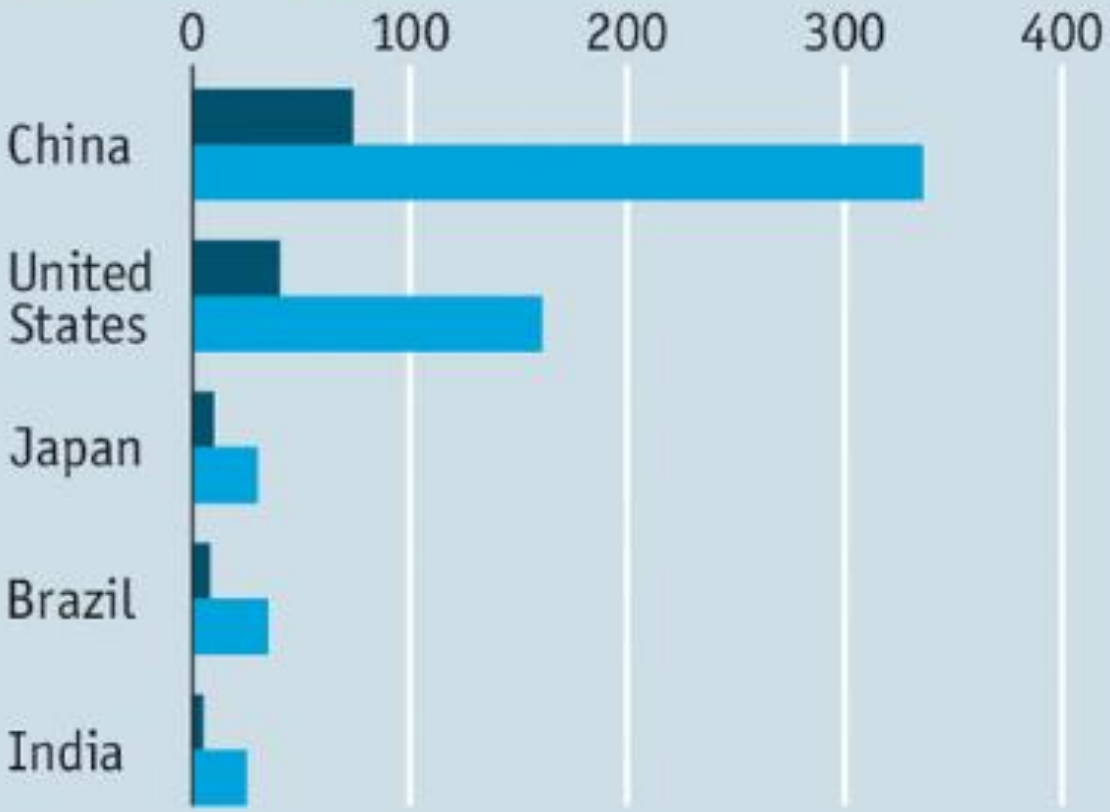
Source: http://www.fool.com/investing/general/2015/02/12/the-internet-of-things-in-4-charts.aspx



Source: https://digitalcontentnext.org/blog/2015/10/13/exploring-the-internet-of-things-in-5-charts/

Machine language

Device-to-device connections, m

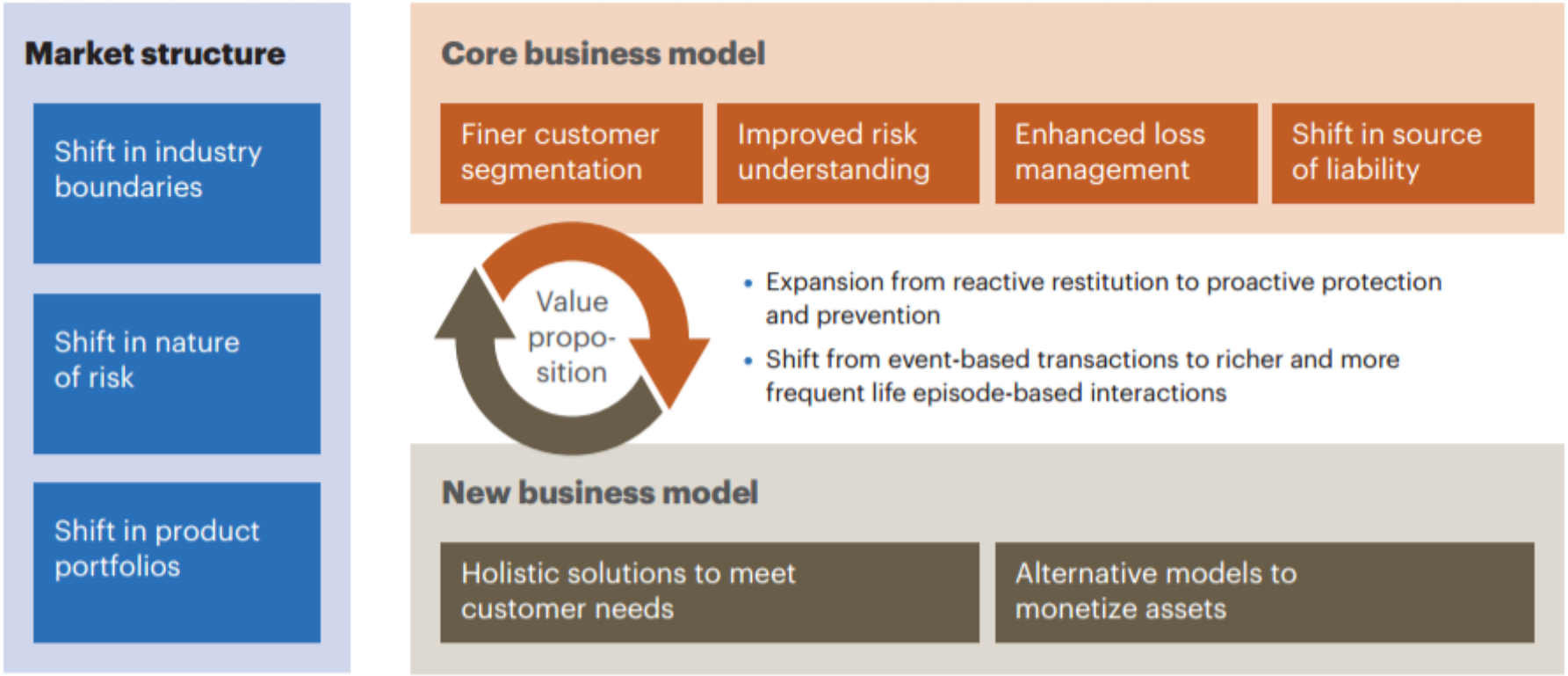


Source: GSMA

Economist.com

Internet Of Things In Insurance

- Real-time data collection from multiple sources. 50 billion devices worldwide.
- Cloud-based analytics.
- Usage analysis: e.g. pay-as-you-drive rates.
- Lifestyle analysis.
- Customized policies and premiums.
- Customer centricity.

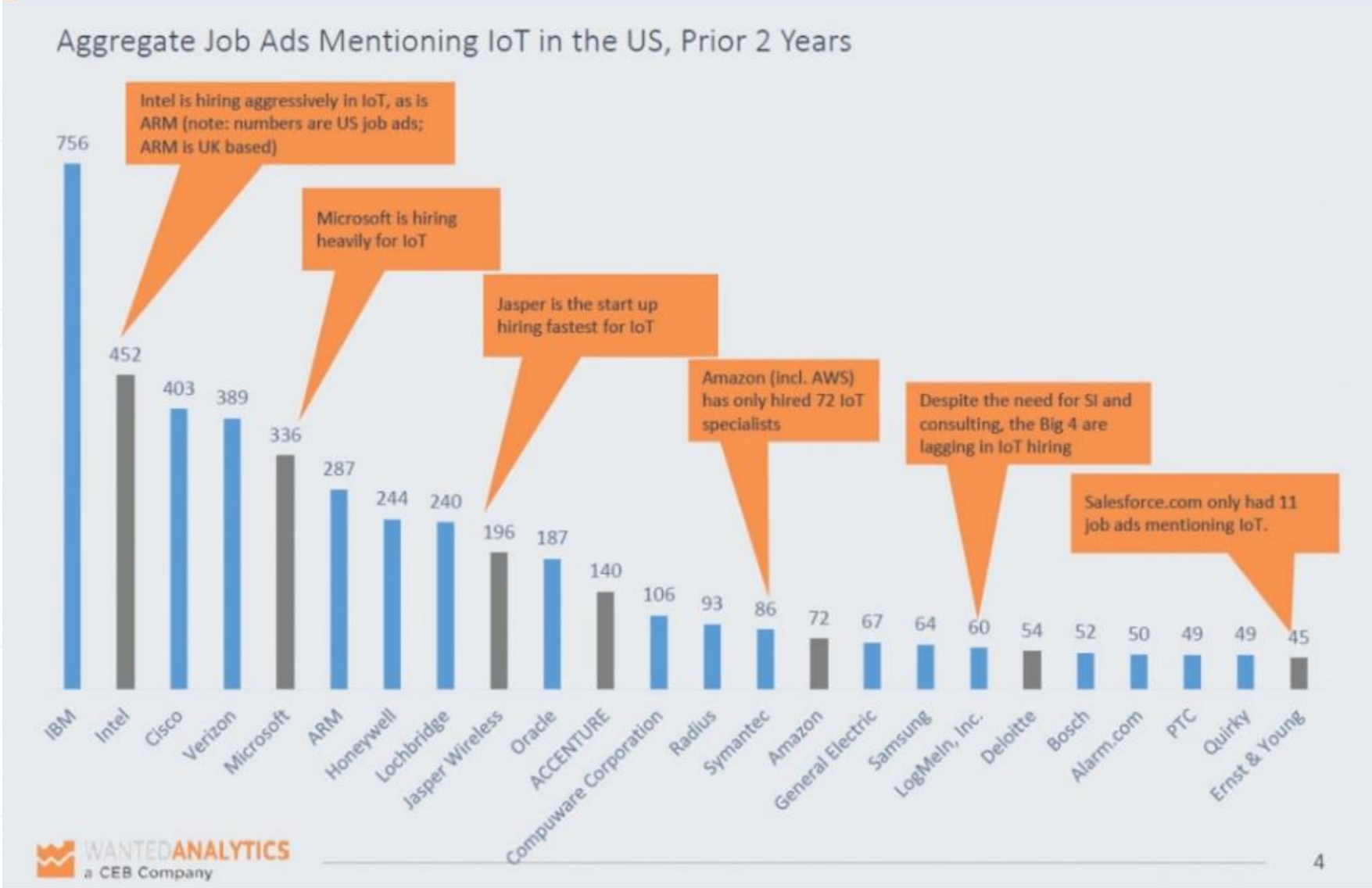


Source: https://www.atkearney.com/documents/10192/5320720/Internet+of+Things+-+Opportunity+for+Insurers.pdf/4654e400-958a-40d5-bb65-1cc7ae64bc72

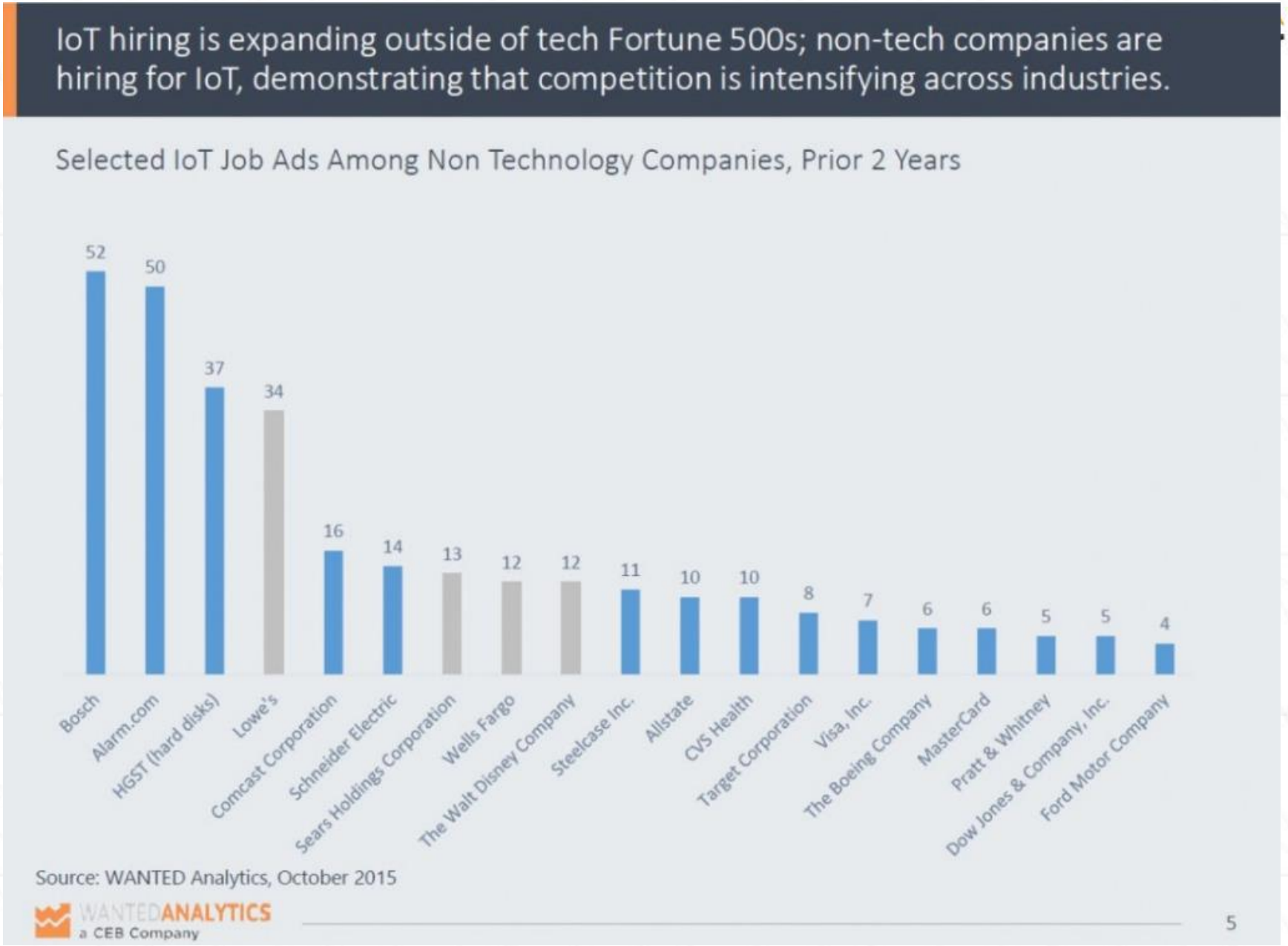
Risk Appraisal & Underwriting

- Old: proxies such as demographics, scores, and history.
- New: behavior-based & usage-based insurance, enabled by telematics.
- Privacy & regulatory concerns.

IBM, Intel, Cisco and Verizon are the only companies hiring more aggressively than Microsoft in "Internet of Things".



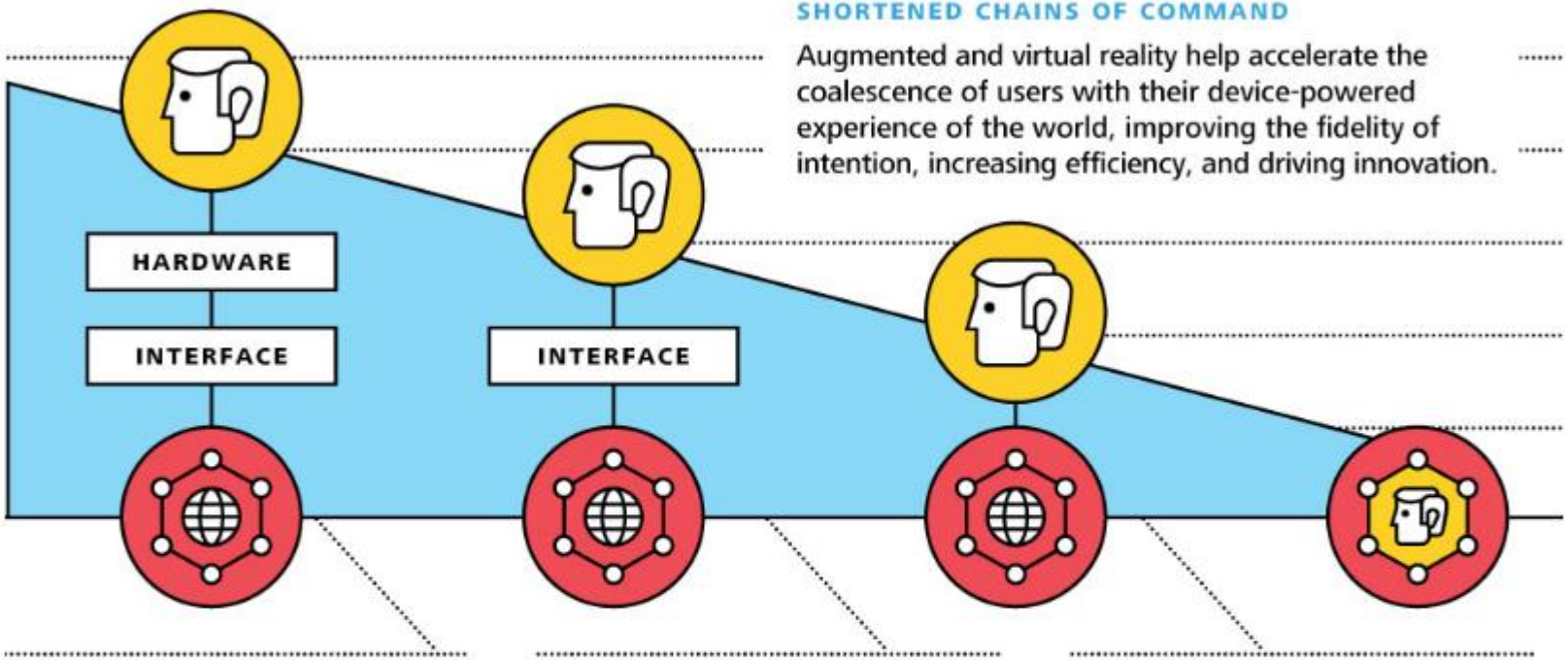
Source: http://bigdata-madesimple.com/gartner-predicts-five-big-data-trends-that-will-dominate-2016/



Source: http://bigdata-madesimple.com/gartner-predicts-five-big-data-trends-that-will-dominate-2016/

Augmented & Virtual Reality

Figure 1. The evolution of interaction



SHORTENED CHAINS OF COMMAND

Augmented and virtual reality help accelerate the coalescence of users with their device-powered experience of the world, improving the fidelity of intention, increasing efficiency, and driving innovation.

MESSENGERS

Intermediate devices interact with interfaces; virtually all input occurs through a mouse or keyboard.

SMART SCREENS

Screens manipulated based on environment facilitate direct physical or spoken interaction with displays.

INTUITIVE INTERACTION

Devices respond to ambient cues and intentional movements to create empathetic, personalized experiences.

Graphic: Deloitte University Press | DUPress.com

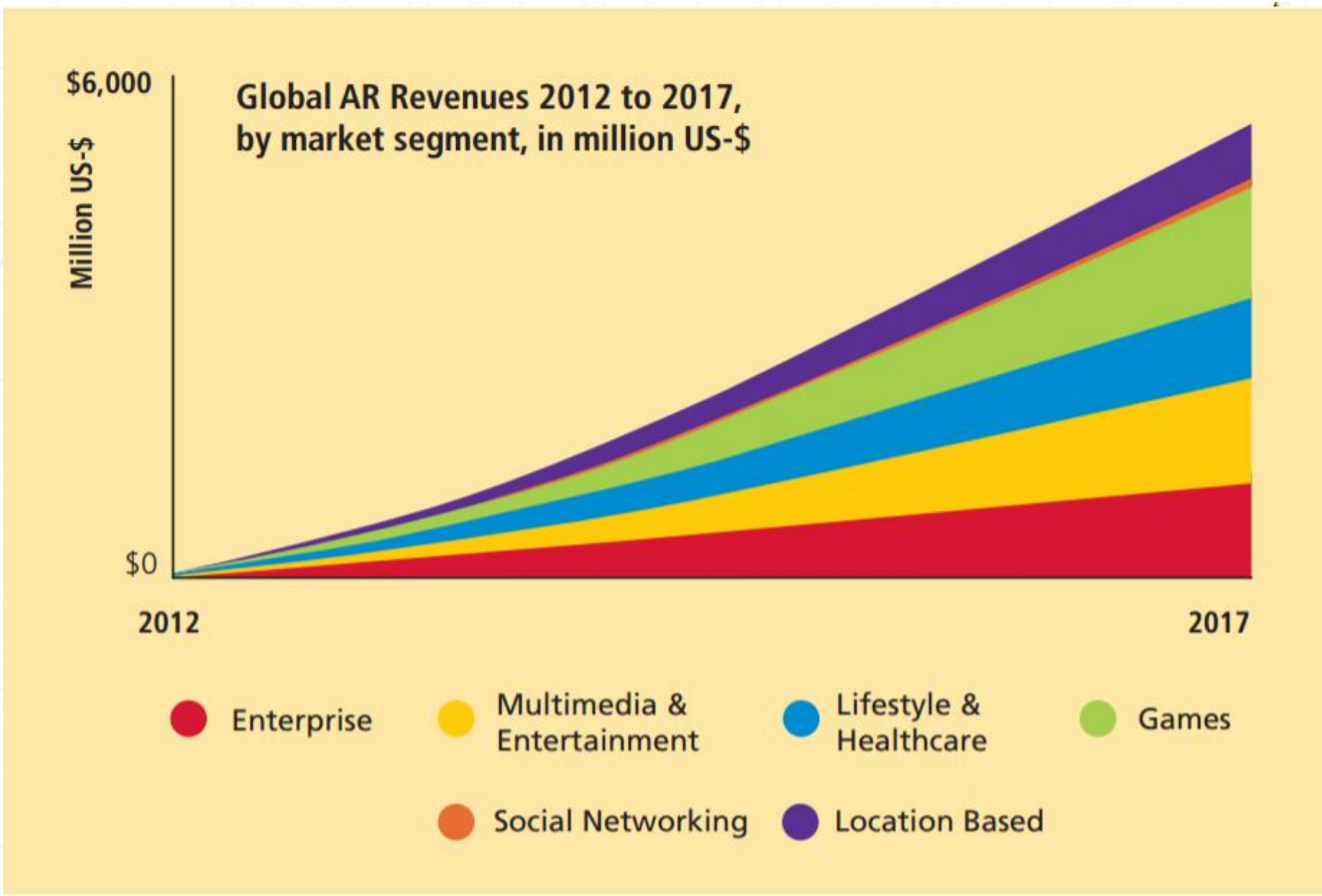


Figure 2: Global AR Revenues 2012–2017 (estimate); **Source:** Xcubelab

Augmented Reality In Transportation

Completeness Check

- AR devices register if a delivery is complete and ready for pick-up
- Capturing pallet and parcel numbers and volume using markers or advanced object recognition technology
- Automated confirmation of pick-up by AR after the correct number of undamaged parcels is recognised
- **Main objectives:** time savings, completeness check, damage detection

International Trade

- AR support for global trade service providers
- AR devices can check (printed) trade documents and identify commodity code classification
- Real-time translation of parcel labels or foreign trade terms
- **Main objectives:** facilitate trade documentation and international freight handling

Source: http://www.dhl.com/content/dam/downloads/g0/about_us/logistics_insights/csi_augmented_reality_report_290414.pdf

Augmented Reality In Transportation

Dynamic Traffic Support

- Replacement of navigation systems in delivery vehicles with AR devices (glasses or windshield projection)
- Analysis of real-time traffic data and display of relevant information (e.g. blocked or alternative routes) in the driver's field of vision
- Superimposing critical information on surrounding, vehicle and cargo (e.g. temperature of cold store)
- **Main objective:** optimized routing on the fly, improvement of driving safety, minimizing of driver distraction

Freight Loading

- Use of AR devices for optimized cargo loading
- Loader receives load plan and instructions (which pallet to take next and where to put it) directly on their AR device display
- Renders printed load lists unnecessary
- **Main objective:** speed up the freight loading process

Source: http://www.dhl.com/content/dam/downloads/g0/about_us/logistics_insights/csi_augmented_reality_report_290414.pdf

Augmented Reality In Transportation

Parcel Loading & Drop-off

- Equip staff with wearable AR devices for parcel handling, loading, and delivery processes
- Through AR, all parcels are overlaid with critical information (e.g., contents, weight, and destination) and handling instructions, and parcels are loaded intelligently into the vehicle
- **Main objectives:** improve parcel handling, avoid improper handling, ensure load optimization

Last-meter Navigation

- AR-supported identification of buildings and entrances, as well as indoor navigation for faster delivery
- A learning system that is able to add user-generated content, particularly when public databases are unavailable
- **Main objectives:** efficient indoor navigation, reduce search and delivery time, especially for first-time deliveries

Source: http://www.dhl.com/content/dam/downloads/g0/about_us/logistics_insights/csi_augmented_reality_report_290414.pdf

Augmented Reality In Transportation

AR-secured Delivery

- AR-based unambiguous identification of the parcel receiver using face-recognition technology
- Visual approval/refusal instead of ID card or signature
- **Main objectives:** improve security of registered letters, speed up the delivery process
- Service would require approval and registration in advance

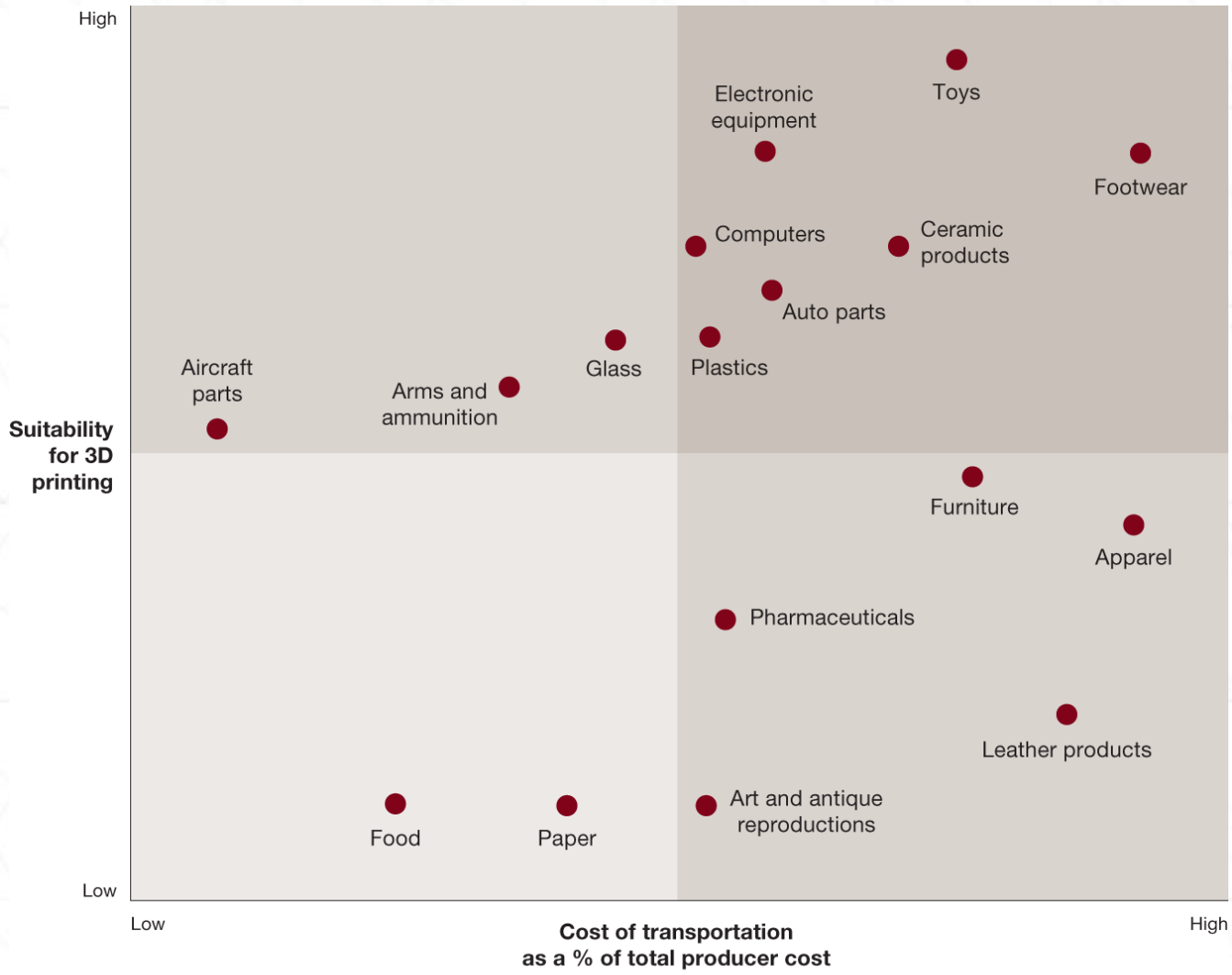
Assembly and Repair

- Assembly and repair teams are equipped with hands-free AR devices (glasses) and software that support specific tasks
- The software blends in visual step-by-step instructions for the assembly or repair while keeping each worker's hands free to conduct these steps
- **Main objectives:** control quality, significantly reduce training costs

Source: http://www.dhl.com/content/dam/downloads/g0/about_us/logistics_insights/csi_augmented_reality_report_290414.pdf

3D Printing

3D Printing's Impact on Transportation



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Source: http://www.strategyand.pwc.com/perspectives/2015-commercial-transportation-trends

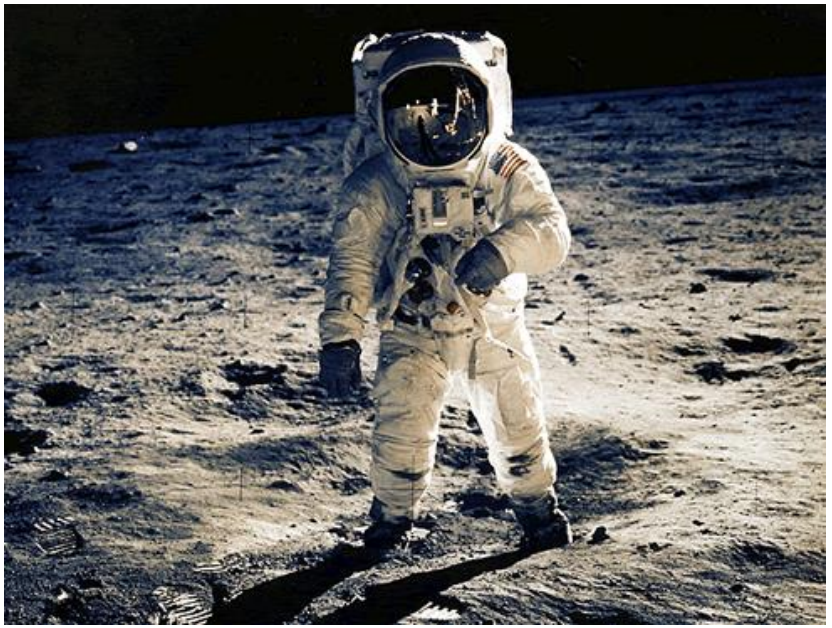
Impact Of 3D Printing On The Supply Chain

- Manufacturing lead times reduced to minutes.
- Shorter time to market for new designs.
- More efficient use of materials, including leftover substrate powder.
- Reduced inventories.

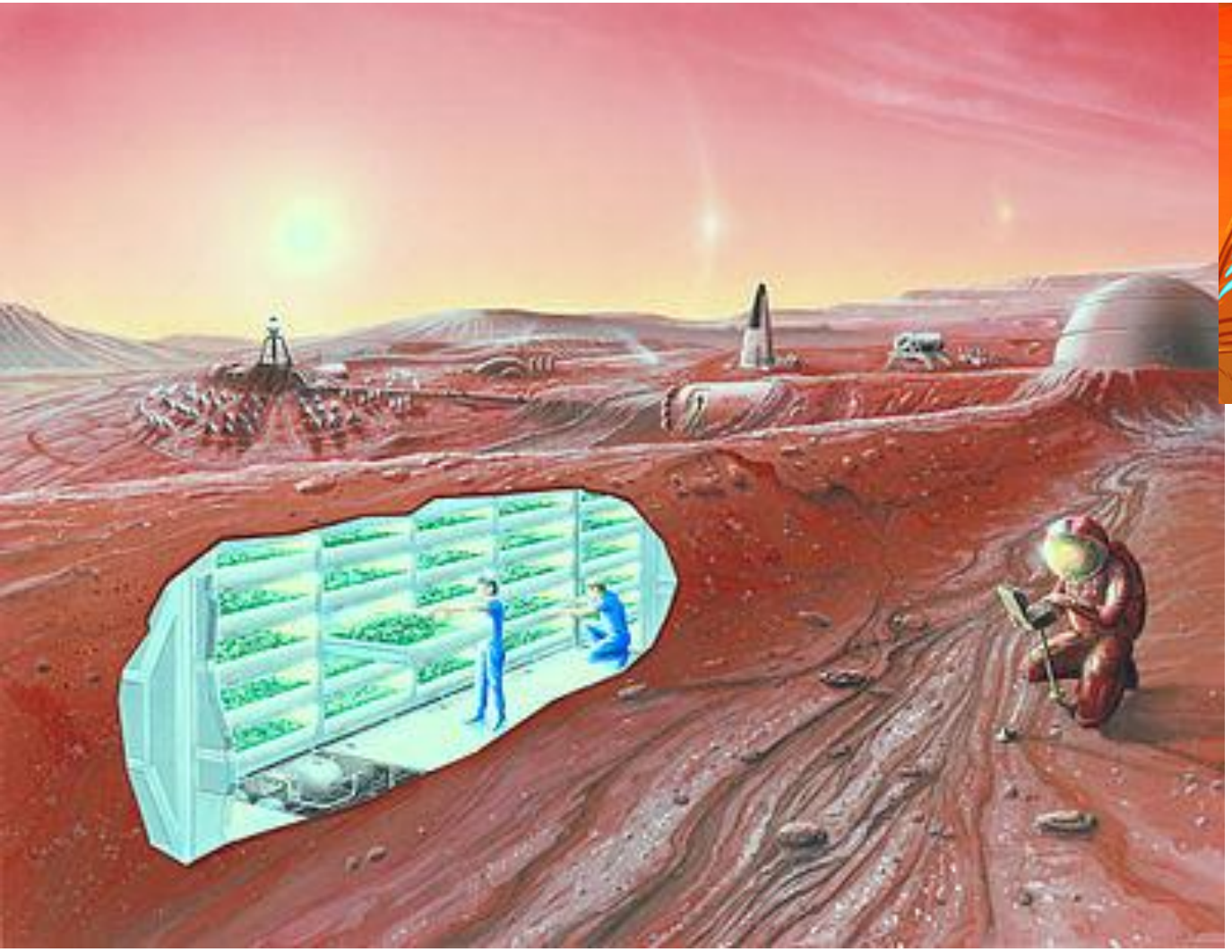

MADE
IN SPACE

Apollo Program Technologies

- Aeronautics.
- Engineering.
- Computing.
- New materials.
- Water purification.
- Clothing and footwear.
- Food preservation.
- Medicine and fitness.



Mars Colonization?



Nanotechnologies Or The Manipulation Of Matter On An Atomic, Molecular Or Supramolecular Scale

- Stronger materials.
- Higher-strength composites.
- Sustainability through durability and more energy efficiency.
- Nanomedicine: diagnostics and treatment.
- Nanorobotics.
- Programmable matter.

Big Data and Computational Analysis

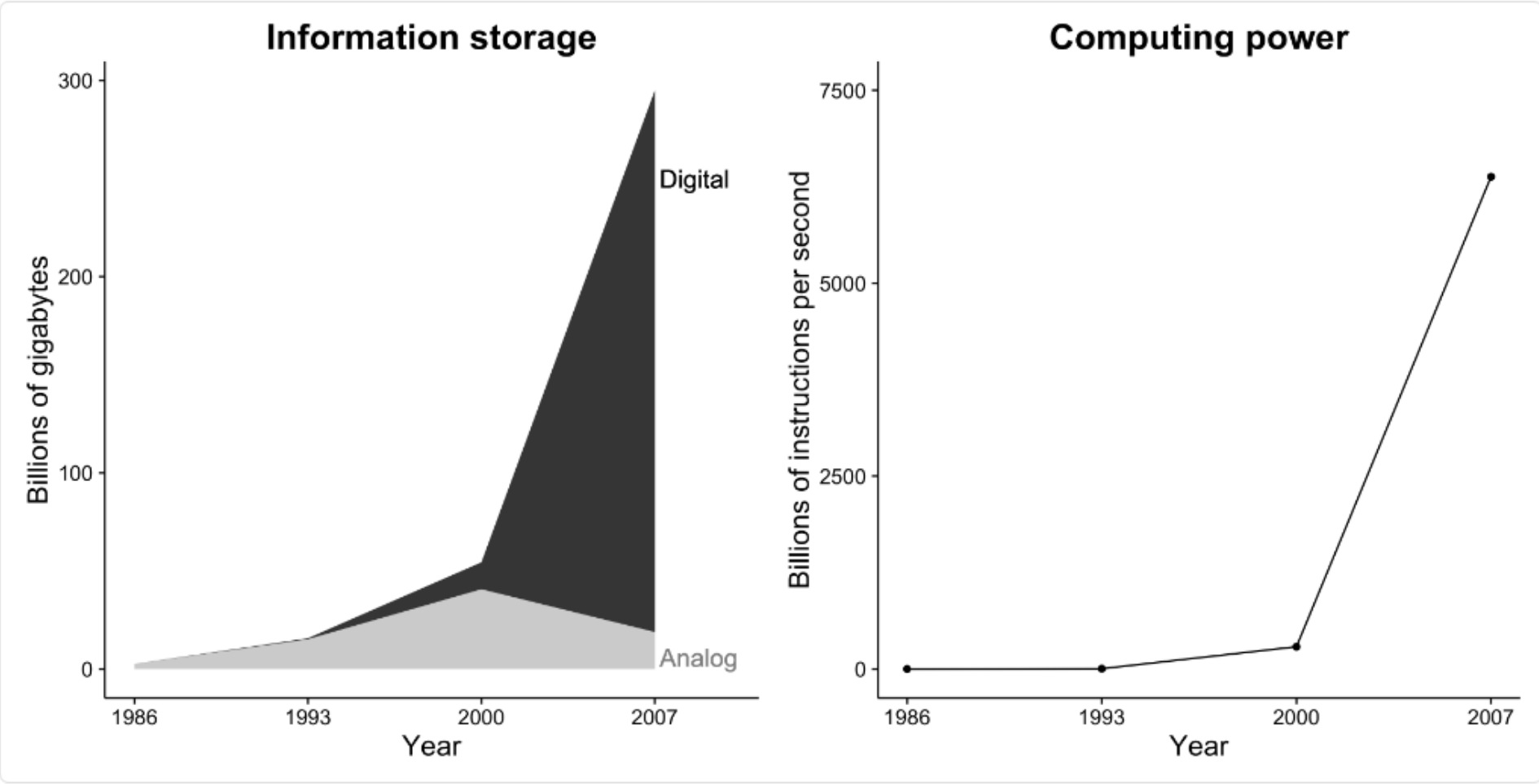


Figure 1.1: Information storage capacity and computing power are increasing dramatically. Further, information storage is now almost exclusively digital (Hilbert and López 2011). These changes create incredible opportunities for social researchers.

Source: Matthew Salganik, http://www.bitbybitbook.com/en/introduction/digital-age/

Big Data and Computational Analysis

- Data and metadata are recorded and stored on a massive basis, everywhere.
- Everything becomes measurable.
- Everything becomes randomizable.
- From statistics to data science.
- Computer power now enables large-scale analysis of data.
- Using algorithms to pick up the signal in the noise.

Source: Matthew Salganik, http://www.bitbybitbook.com/en/introduction/digital-age/

Advantages Of Big Data

- Real-time, always-on measures.
- Non-reactive (no Hawthorne effect).
- Study of rare events.
- Assessment of small differences.

Source: Matthew Salganik, http://www.bitbybitbook.com/en/introduction/digital-age/

Pitfalls Of Big Data

- Non-representativeness: Big data may not reflect the population of interest.
- Drifting: The population using the system, their behavior or use of the system, and the system itself may change over time.
- Algorithmic confounding: Big data get collected in situations in which specific behaviors are engineered (i.e. clicking on ads or posting content).

Source: Matthew Salganik, http://www.bitbybitbook.com/en/introduction/digital-age/

From Forecasting To Nowcasting.

- Big data makes forecasting the present much easier than forecasting the future.
- Example: Google Flu Trends.
  - They used data on 50 million different search terms to see which were more predictive of the CDC flu data (collected with a two-week lag).
- But nowcasting may not outperform simple linear extrapolation, and is subject to drift and confounding biases.

Source: Matthew Salganik, http://www.bitbybitbook.com/en/introduction/digital-age/

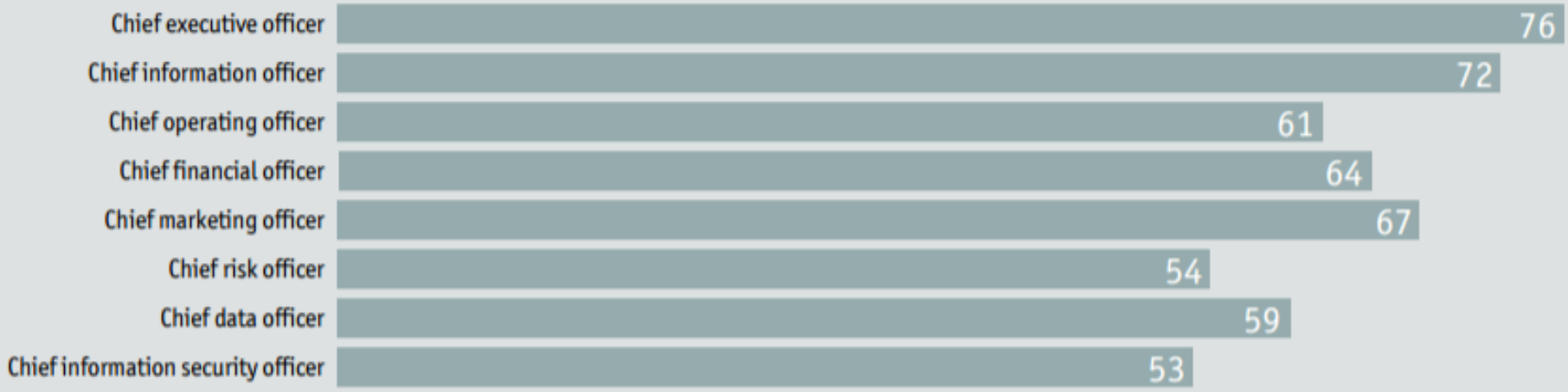
Chart 1. **Which of the following statements most closely describe your view of the future of big data?**

% of respondents

Source: Economist Intelligence Unit survey, September, 2014.

Chart 2. **What is the overall attitude towards big data among your C-level colleagues?**

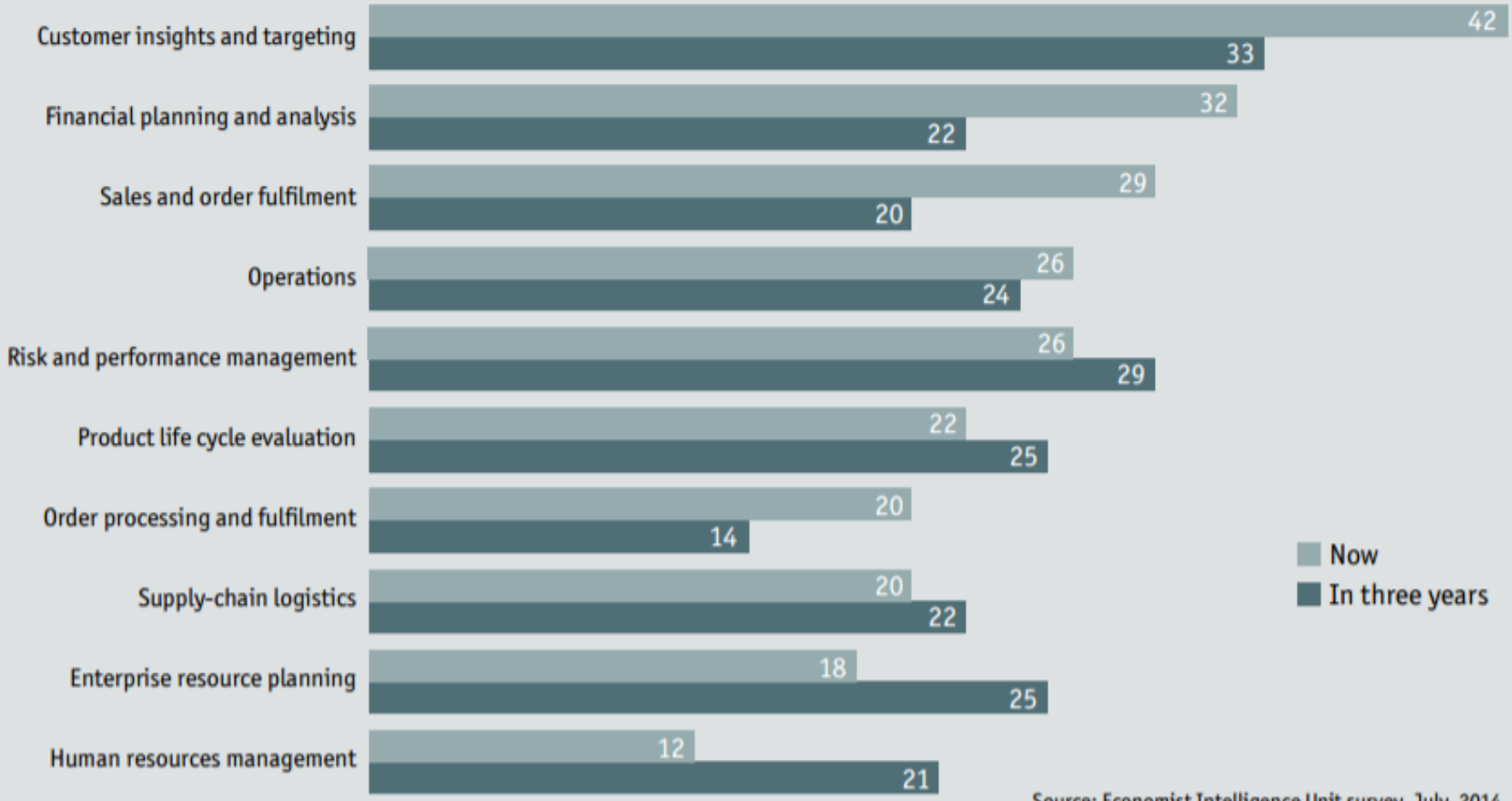
% of respondents who selected "positive" or "very positive"



Source: Economist Intelligence Unit survey, September, 2014.

Chart 4. **Which of the following business processes do you believe are the most important priorities for the application of big data now, and which will be most important in three years?**

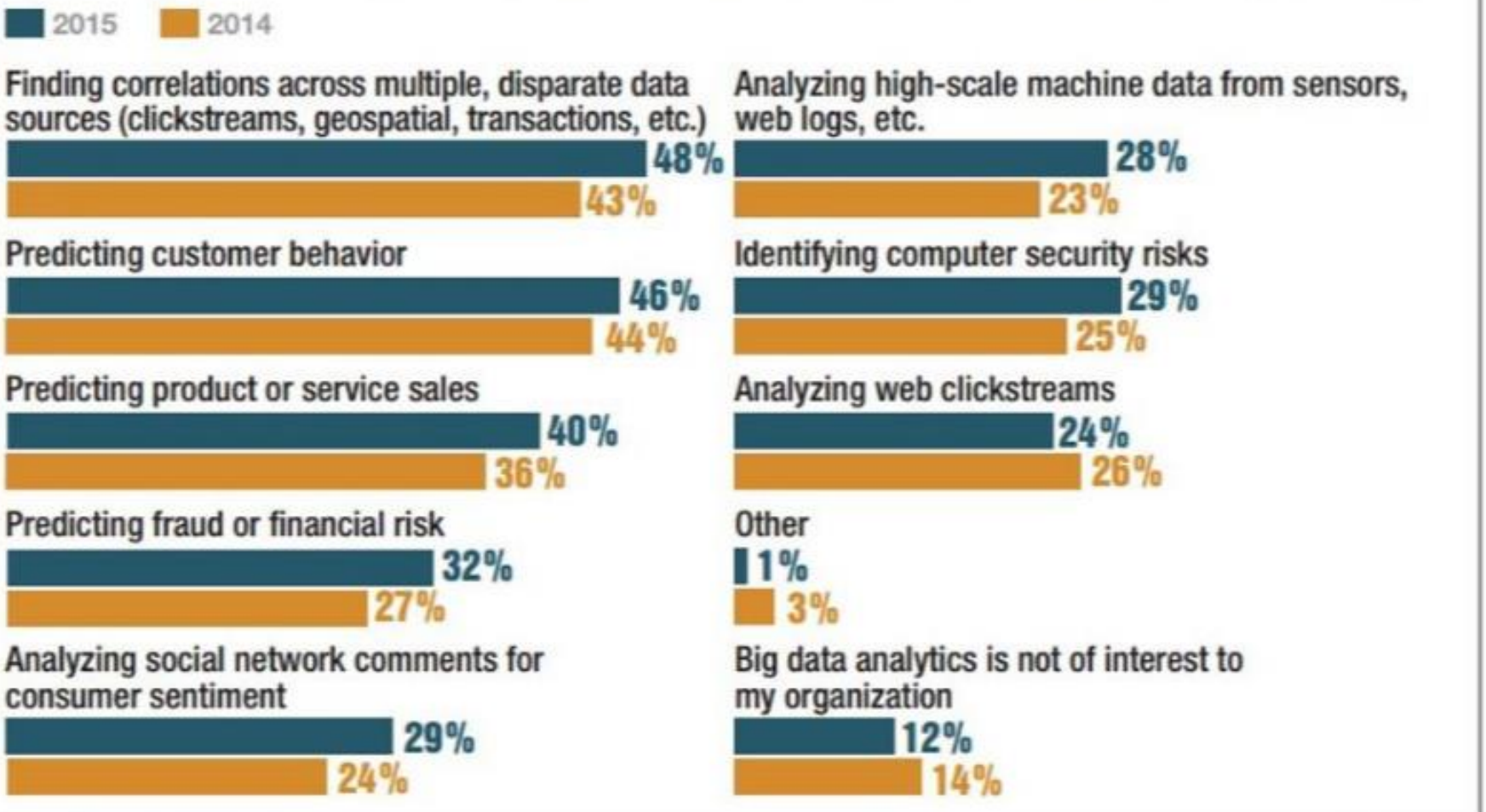
% of respondents



Source: Economist Intelligence Unit survey, July, 2014.

Factors Driving Interest in Big Data Analysis

What data sources or challenges are driving, or would drive, your organization's interest in doing big data analysis?



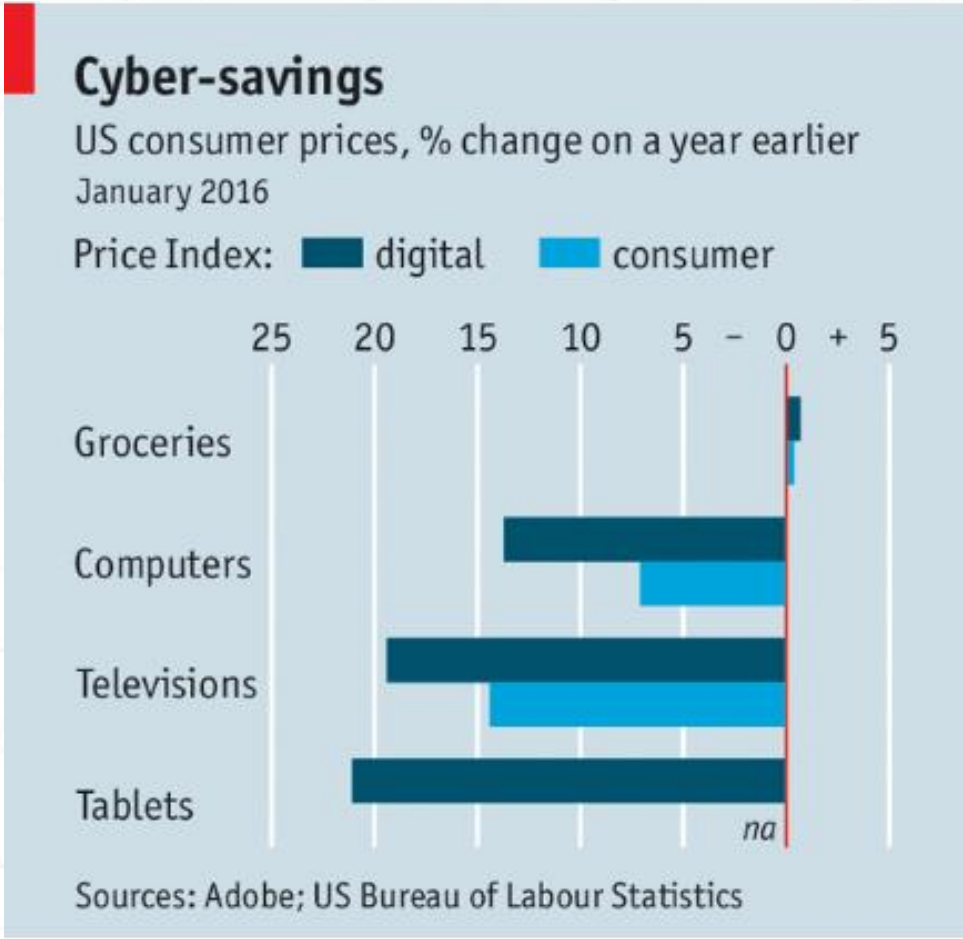
Note: Multiple responses allowed

R8241114/10

Base: 297 respondents in October 2014 and 248 in October 2013 at organizations using or planning to deploy data analytics, BI, or statistical analysis software

Data: InformationWeek Analytics, Business Intelligence, and Information Management Survey of business technology professionals

Calculating The Consumer Price Index

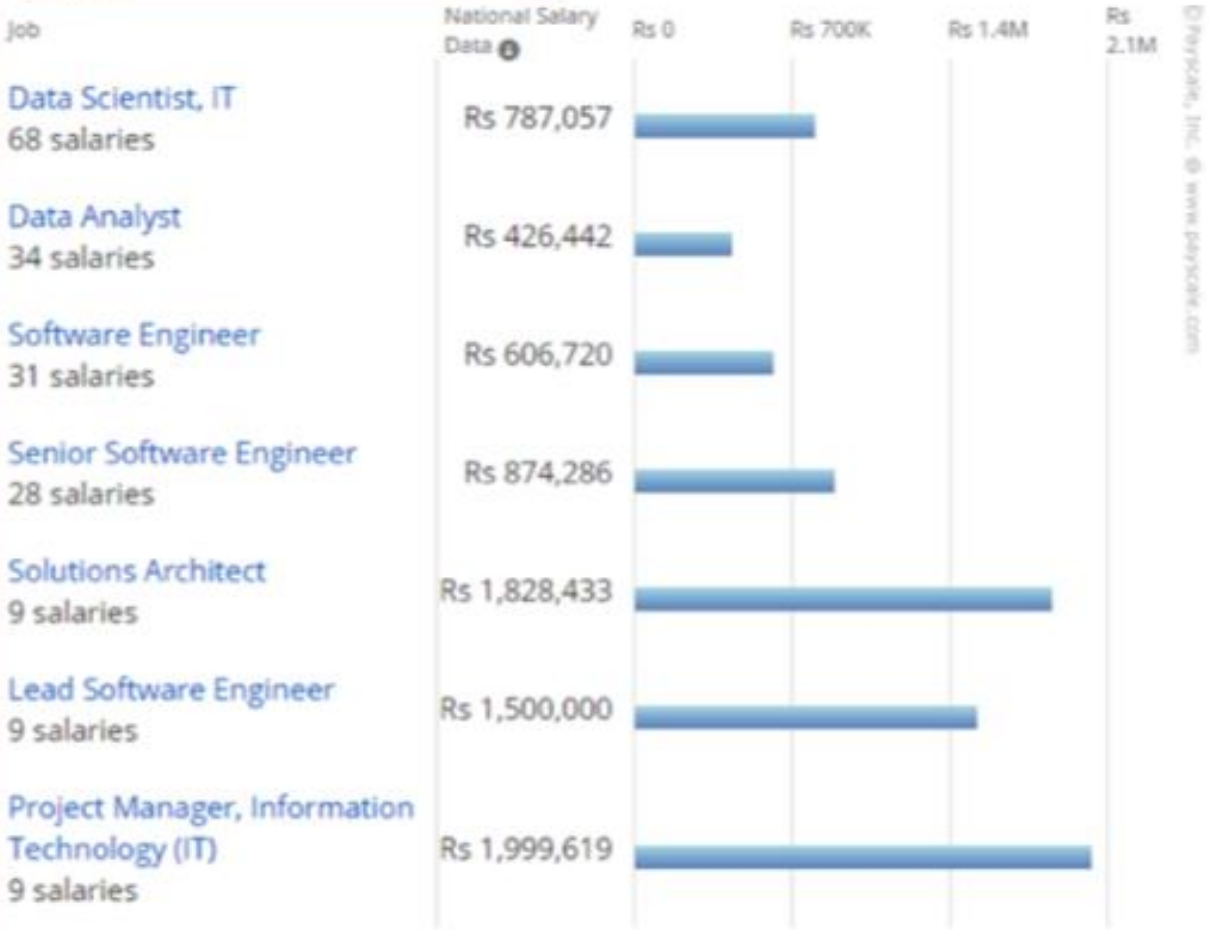


The digital price index (DPI):

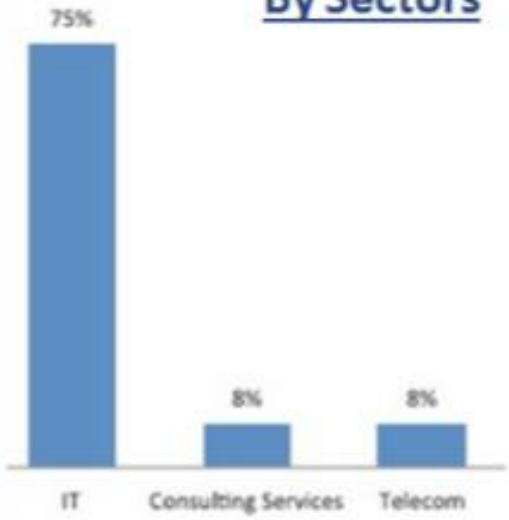
- Tracks 1.4 mn goods (compared to 80,000 for the classic CPI).
- Is based on actual purchases rather than advertised prices.
- Is always-on.

Big Data Market Snapshot

Big Data Jobs In India



By Sectors



By Cities

The Blockchain

Making a hash of it

INPUT

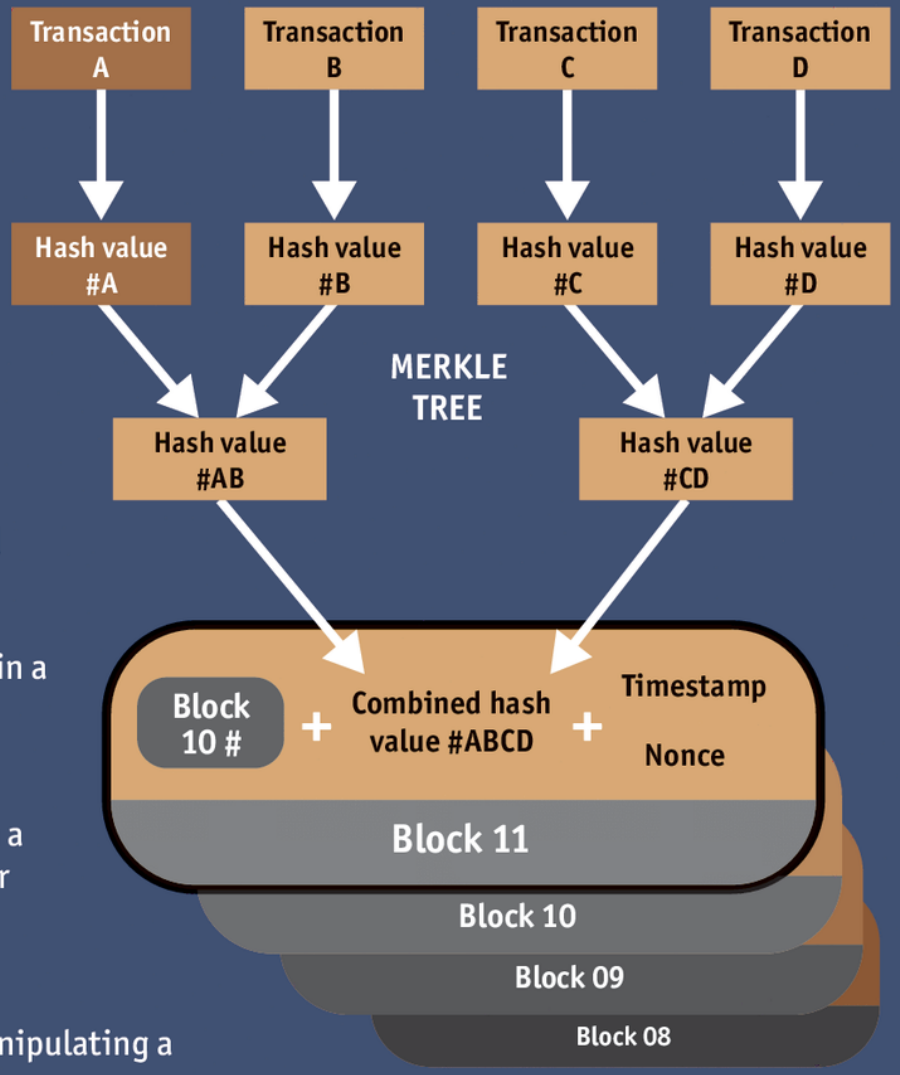
Transaction A

Any length of data

OUTPUT #A

#DFCD 24D9 AEFE 93B9

Unique hash value of fixed length



Each transaction in the set that makes up a block is fed through a program that creates an encrypted code known as the hash value.

Hash values are further combined in a system known as a Merkle Tree.

The result of all this hashing goes into the block's header, along with a hash of the previous block's header and a timestamp.

The header then becomes part of a cryptographic puzzle solved by manipulating a number called the nonce.

Once a solution is found the new block is added to the blockchain.

How a bitcoin transaction is processed

1 Payers initiate a bitcoin payment using third-party "wallet" software.

2 This and other pending transactions are broadcast on the global bitcoin network.

3 Every ten minutes or so, specialised computers on this network, known as "miners", collect a few hundred transactions and combine them in a "block".

4 Miners process the block, reaching a consensus on what the new "blockchain" should look like.

5 Miners are rewarded with newly minted bitcoin for providing vast amounts of computing power– giving them a stake in the smooth function- ing of the currency.

6 Miners disseminate the new blockchain to the entire network, recording the transactions in the latest block.

7 The payee can use his wallet software to see whether the bitcoin has arrived.

DIGITAL CURRENCY

Federal Reserve Bank of Richmond (2

New Private Currencies Like Bitcoin Offer Potential — and Puzzles

"...digital currencies do not currently pose a material risk to monetary or financial stability in the United Kingdom, but it is conceivable that potential risks could develop over time. The distributed ledger is a genuine technological innovation which demonstrates that digital records can be held securely without any central authority."

BANK OF ENGLAND

Chicago Fed Letter

it represents a remarkable conceptual and technical achievement, which may well be used by existing financial institutions (which could issue their own bitcoins) or even by governments themselves.

Bitcoin: A primer

by François R. Velde, senior economist

Tech giants, Federal Reserve eye digital currency

By GCN Staff Mar 20, 2015

According to recent reports IBM and Intel – and possibly the Federal Reserve – are considering using a popular technology associated with bitcoin – called blockchain – in order to create a new digital payments system.

REUTERS

"These coins will be part of the money supply," the source said. "It's the same money, just not a dollar bill with a serial number on it, but a token that sits on this blockchain."

THE WALL STREET JOURNAL.

Bitcoin and the Digital-Currency Revolution

For all bitcoin's growing pains, it represents the future of money and global finance.

INSTEAD OF FIGHTING BITCOIN, THE US COULD MAKE ITS OWN DIGITAL CURRENCY

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