MarshMcLennan

Marsh Mercer OliverWyman

MARSH McLENNAN MANUFACTURING & AUTOMOTIVE INDUSTRY SUMMIT

September 21, 2022

Agenda

- Opening
- Welcome Remarks
- Industry Fireside Chats with Marsh, Mercer and Oliver Wyman
- Special Keynote Address
- Q&A and Close

Today's Speakers

David Carlson

US Manufacturing & Automotive Industry Leader
Marsh

Amy Barnes

Managing Director, Global Head of Sustainability and Climate Change Strategy, Marsh

John Ellis

Best-Selling Author & Futurist, Former Ford Motor Company Technologist, Jte Consulting

Paul Brock

VP and Treasurer,
MAGNA International

Michael Ponicall

Managing Partner
Mercer

Mark Valerius

VP Global Total Rewards
Stellantis

Daniel Kronenwett

Partner, Climate & Sustainability Lead for the Industrial Sector
Oliver Wyman

Dieter Vollkommer

SVP Sustainability & Corporate Responsibility
Siemens Energy

Opening

David Carlson

US Manufacturing &
Automotive Industry Leader
Marsh

Welcome Remarks

Amy Barnes

Managing Director, Global Head of
Sustainability and Climate Change Strategy
Marsh

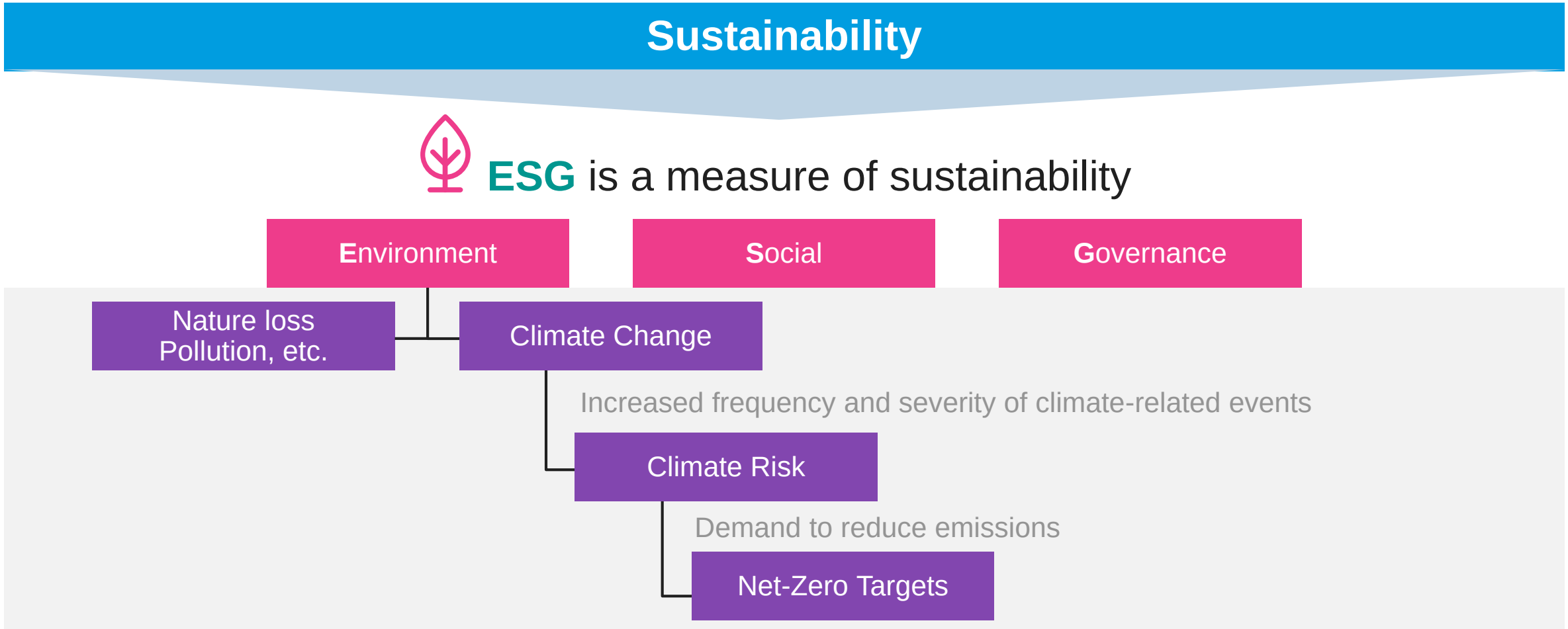
The future of the industry: By 2030

Prediction from June 2017

- Private car ownership will drop 80% by 2030 in the US.
- The number of passenger vehicles on American roads will go from 247 million in 2020 to 44 million in 2030.
- Using electric ride-shares will be four to ten times cheaper per mile than buying a new car by 2021 (and each family could save up to $5,600 per year, compared to purchasing and maintaining a traditional vehicle).

Tony Seba, Stanford economist

ESG is a measure of sustainability – climate change is a component of the ‘E’ in ESG



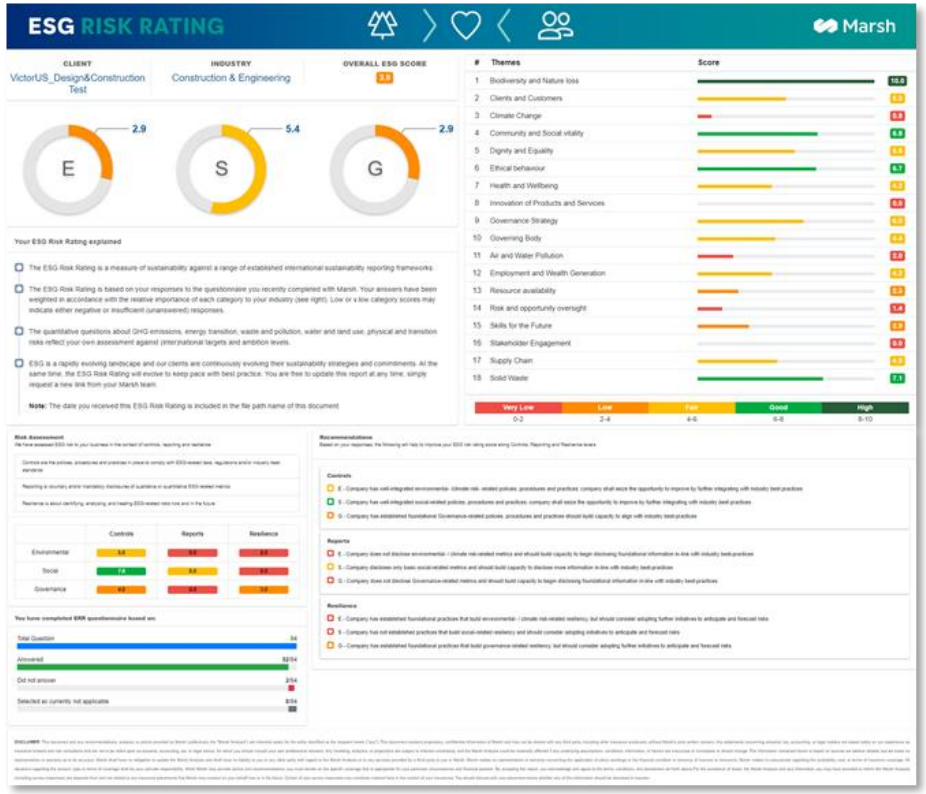
Screening: ESG Risk Rating

Marsh has developed the ESG Risk Rating, a self-assessment tool for clients

Key to know

- **Generates an intuitive** “**scorecard**” based on a set of quantitative questions across 18-core ESG themes.
- A **robust and comprehensive** question set
  - Leveraged >10 internationally-recognized standards.
  - Validated with key experts across Marsh McLennan.
- The Rating received **differentiates between more than 60 industries**, recognizing the different relative importance themes across industries.
- Companies can use their scorecard **to mobilize internally as well as share with underwriters (at their discretion).**

Output “scorecard”



ESG and Risk: Our hypothesis

There is a correlation between ESG and risk quality / hazard risk / losses

- D&O
- Liability
  - Workers Compensation
- Property

ESG Works Compensation Correlation Results

following ERR Subcategories:		P-Value	NCCI Mod Correlation
	Social *Labor standards, wages and benefits, diversity, human rights, community relations, privacy and data protection, health and safety, supply chain, and other social justice issues*	0.010	-0.46
	Social (Controls) *The policies, procedures and practices an organization has in place to comply with 'Social' related laws, regulations and/or industry best-standards*	0.004	-0.51
	Community & Social Vitality *Examines an organization's management of their impacts on community and society and their tax governance*	0.010	-0.46
	Dignity & Equality *Examines an organization's management of diversity, equity and inclusion, and human rights awareness in their workforce*	0.020	-0.42

Focus on Climate: Formation of working groups

Bodies seeking to coordinate the insurance industry response

UN Net-Zero Asset Owners Alliance

- Coalition of institutional investors committed to making investment portfolio carbon neutral by 2050.
- 12 of its 16 members from insurance industry.

UN Net-Zero Insurance Alliance

- 21 (re)insurers (including Lloyd's of London) committed to transitioning underwriting portfolio to net-zero GHG emissions by 2050.

ClimateWise

- Global insurance industry initiative – signatories annually report progress against six principles.
- 40 members.
- Marsh is a member.

SMI (Sustainable Markets Initiatives) Insurance Task Force

- Convened by HRH Prince of Wales and chaired by Lloyd's, platform committed to advancing world's progress to a net-zero economy.
- Marsh McLennan is a member.

Focus areas:

Green investment

Net-zero underwriting methodologies

Research and reporting on progress

Product development

What is the impact on organizations?

Changes to anticipate

CAPACITY WITHDRAWALS

- **Certain segments** (e.g., oil sands, artic drilling, coal) **heavily scrutinized,** difficulty placing cover for **specific clients**
- Insurer assessments largely at **entity level** rather than the asset level
- Less cover available for risks with increasing loss profiles (e.g. wildfire)

CHANGES TO POLICY WORDING/ CONDITIONS

- Expected uptick in **exclusion language** for some sectors
- Currently, largely restricted to liability classes
- Examples: **Climate Change Exclusion**, **Modern Slavery Clause** in Marine Cargo Insurance
- Insurers may apply **higher deductibles**. Pay attention to **natural catastrophe sub-limits**.

DIFFERENTIATED SOLUTIONS FOR HIGH PERFORMING CUSTOMERS

- Insurers **incentivizing** ESG related **risk reduction approaches pre-loss.**
- Example: Marsh France **– Biodiversity risk mitigation initiative.**
- Outcomes; increased capacity, broader coverage, improved retentions, premium credits

NEW PRODUCTS

- **Insurance market innovation** to support clients on sustainability journey
- Coverage for **new technologies,** e.g. Carbon capture, utilization, and storage insurance.
- Coverage to **support changing business operations,** e.g. Late-life asset decommissioning insurance
- Building resilience **- parametric coverage to protect against climate risk**

Fireside Chat with Marsh

David Carlson

US Manufacturing &
Automotive Industry Leader

Paul Brock

VP and Treasurer,
MAGNA International

Fireside Chat with Mercer

Michael Ponicall

Managing Partner
Mercer

Mark Valerius

VP Global Total Rewards
Stellantis

Fireside Chat with Oliver Wyman

Daniel Kronenwett

Partner, Climate & Sustainability Lead for the Industrial Sector
Oliver Wyman

Dieter Vollkommer

SVP Sustainability & Corporate Responsibility
Siemens Energy

Keynote Address

John Ellis

Best-Selling Author & Futurist, Former
Ford Motor Company Technologist
Jte Consulting

SEEING AROUND THE CORNER

THE ROLE OF SOFTWARE IN BEING SUCCESSFUL

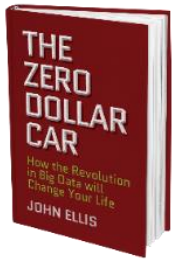
September 21, 2022

JTE Consulting

LiMo Foundation

Apple CarPlay

I help organizations think about their future

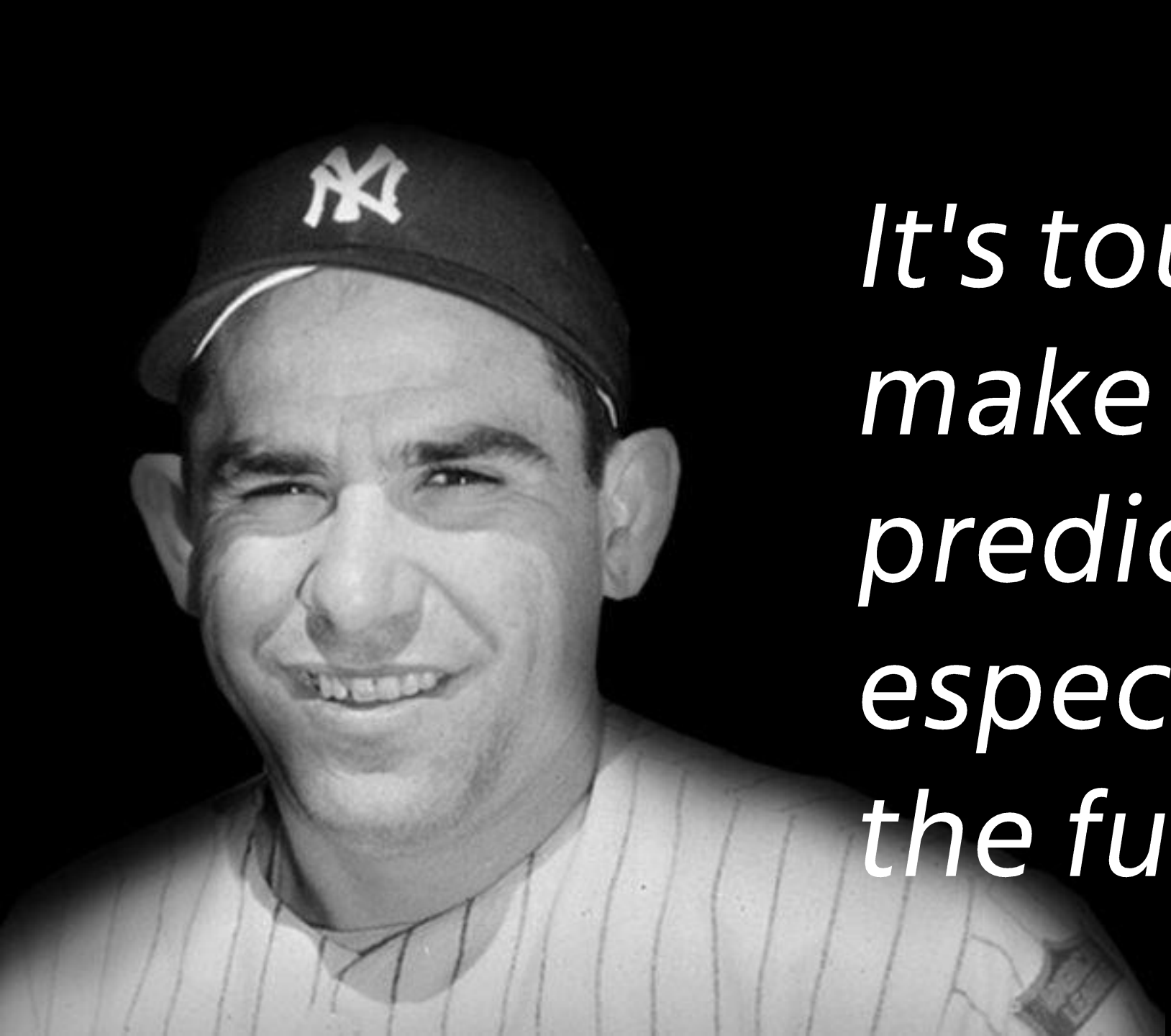


INNOVATING TOGETHER

Only the paranoid survive.

Andy Grove

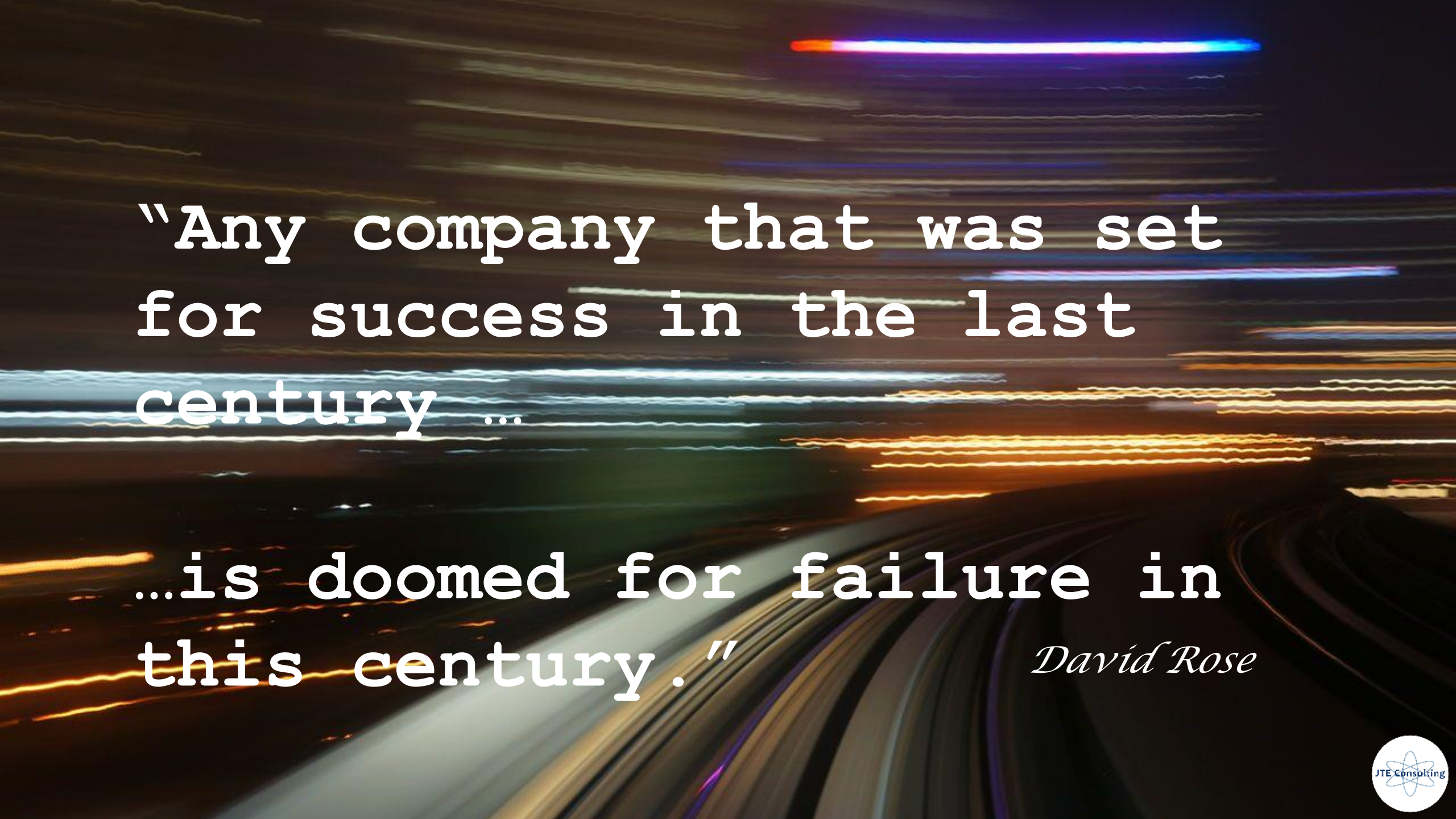
JTE Consulting



It's tough to make predictions, especially about the future.

Yogi Berra

JTE Consulting


"Any company that was set for success in the last century …
…is doomed for failure in this century."
David Rose
JTE Consulting

Emerging disruptive technologies have arrived…

Emerging Disruptions

Nanotechnology

Internet of Things

Robotics

3D Printing

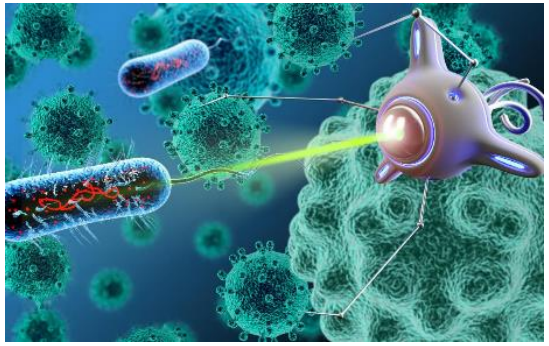
Digital Biology

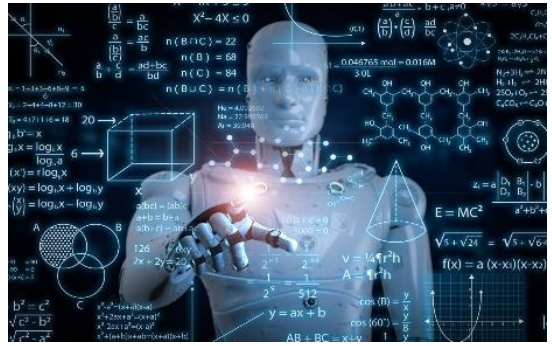
Autonomous Vehicles

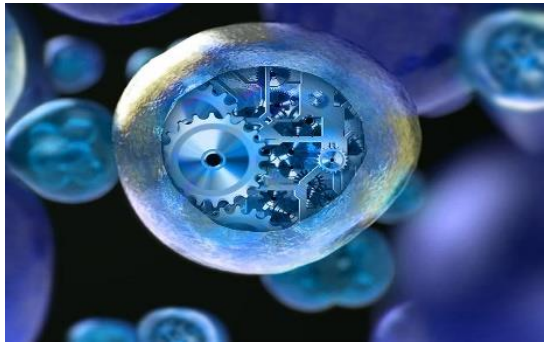
Immersive Reality

Blockchain

Artificial Intelligence

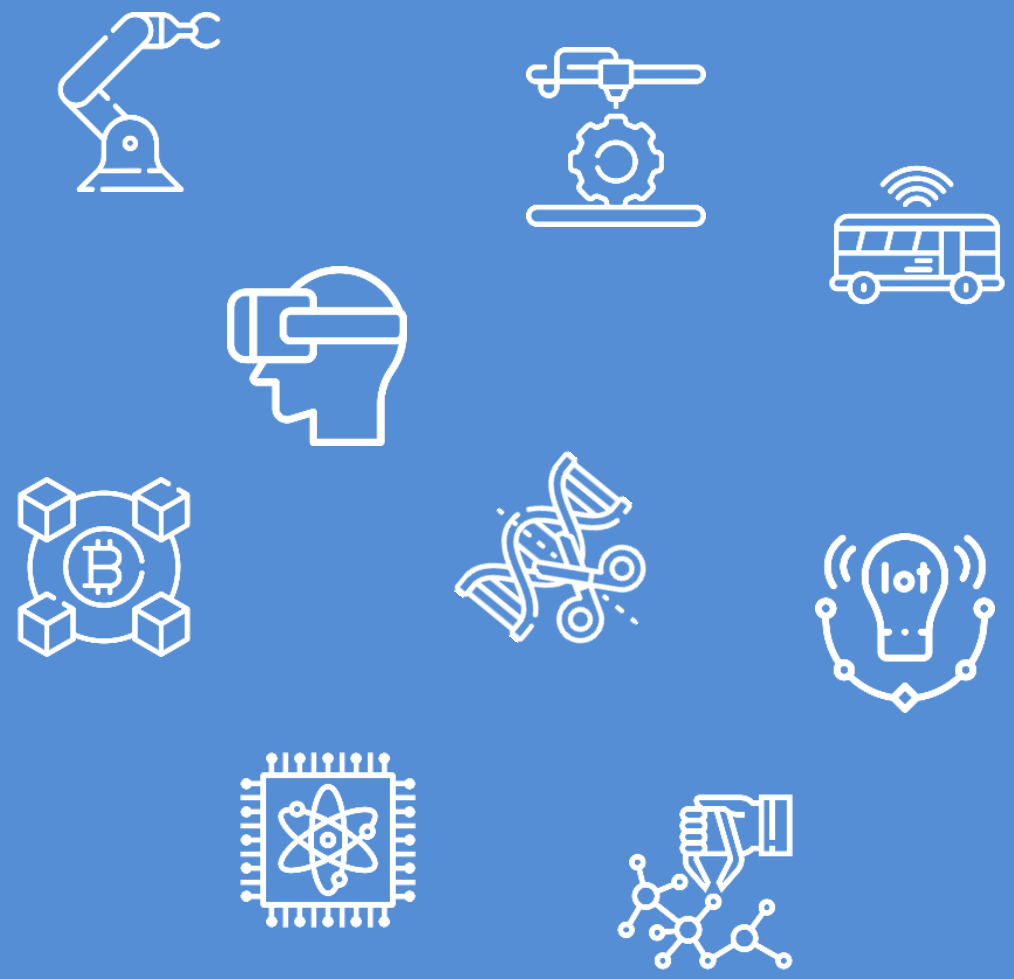






JTE Consulting

… launching disruption across industries



RETAIL > Amazon

HOSPITALITY > AirBnB

EDUCATION > edX

MANUFACTURING > 3D Printing

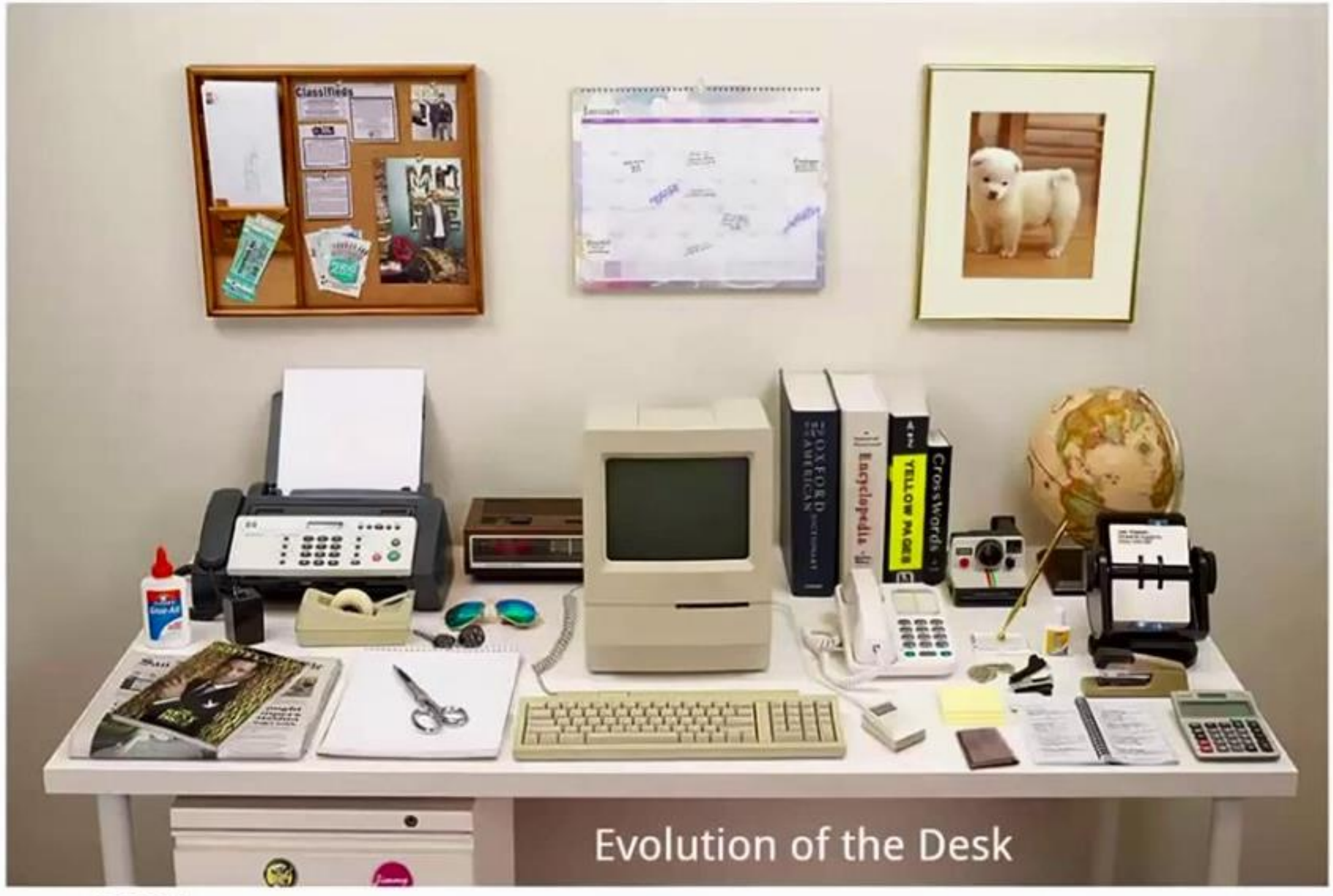
FINANCE > Cryptocurrency

HEALTHCARE > Digital biology

JTE Consulting

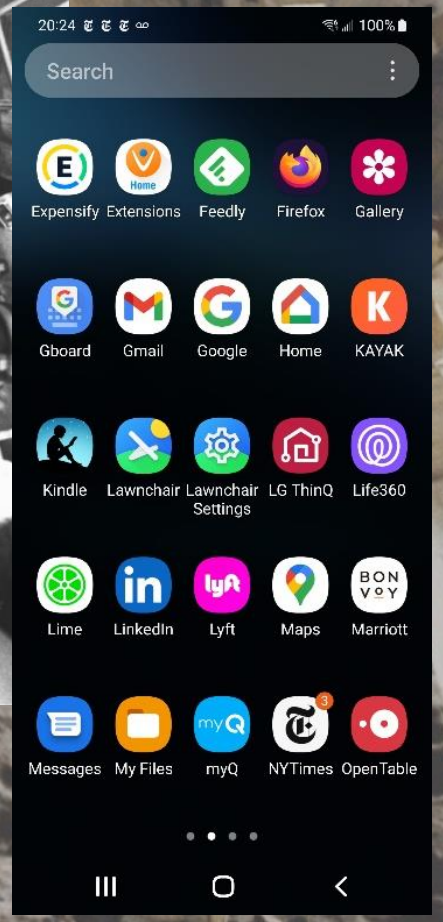
The Forces Underpinning This

1. DIGITIZATION
2. DEMONETIZATION
3. DEMOCRATIZATION



1981

Photography by dougthomsen.tv
Engineering by Anton Georgiev

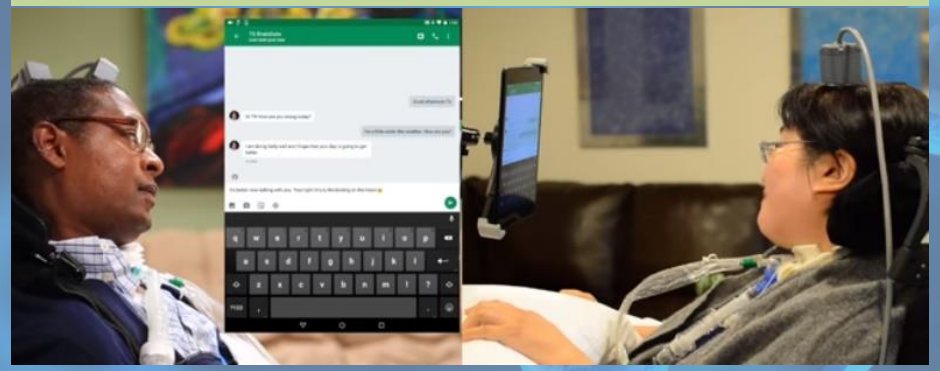


YOUR MOBILE PHONE IS 100's of MILLIONS TIMES FASTER THAN ALL OF NASA'S COMPUTERS USED FOR THE FIRST MOON LANDING.

JTE Consulting

Digitalization of Humans

Brain-computer interface lets paralyzed persons control tablet



World's first CRSPR gene-edited babies born – is the world ready?

Scientists connect 3 brains to allow shared thought

Scientists link human brain to the internet for first time

JTE Consulting

The Forces Underpinning This

1. DIGITIZATION
2. DEMONETIZATION
3. DEMOCRATIZATION

Technology is becoming FASTER & CHEAPER

3D Printing
2007: $100,000
2022: $90

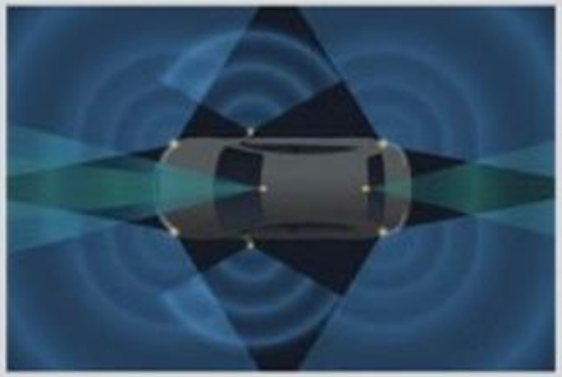
1100x price drop

Industrial robots
2007: $500,000
2022: $15,000

33x price drop

Drones
2007: $100,000
2022: $<50

2000x price drop



LIDAR Sensors
2007: $20,000
2022: $100

200x price drop

Solar
1987: $30 per KwH
2022: $0.010 per KwH

3000x price drop

Biotech (1 DNA profile)
2007: $10,000.000
2022: $89

112,000x price drop

JTE Consulting

Yesterday vs. **Today**

RECORD STORE

BOOK STORE

LONG DISTANCE

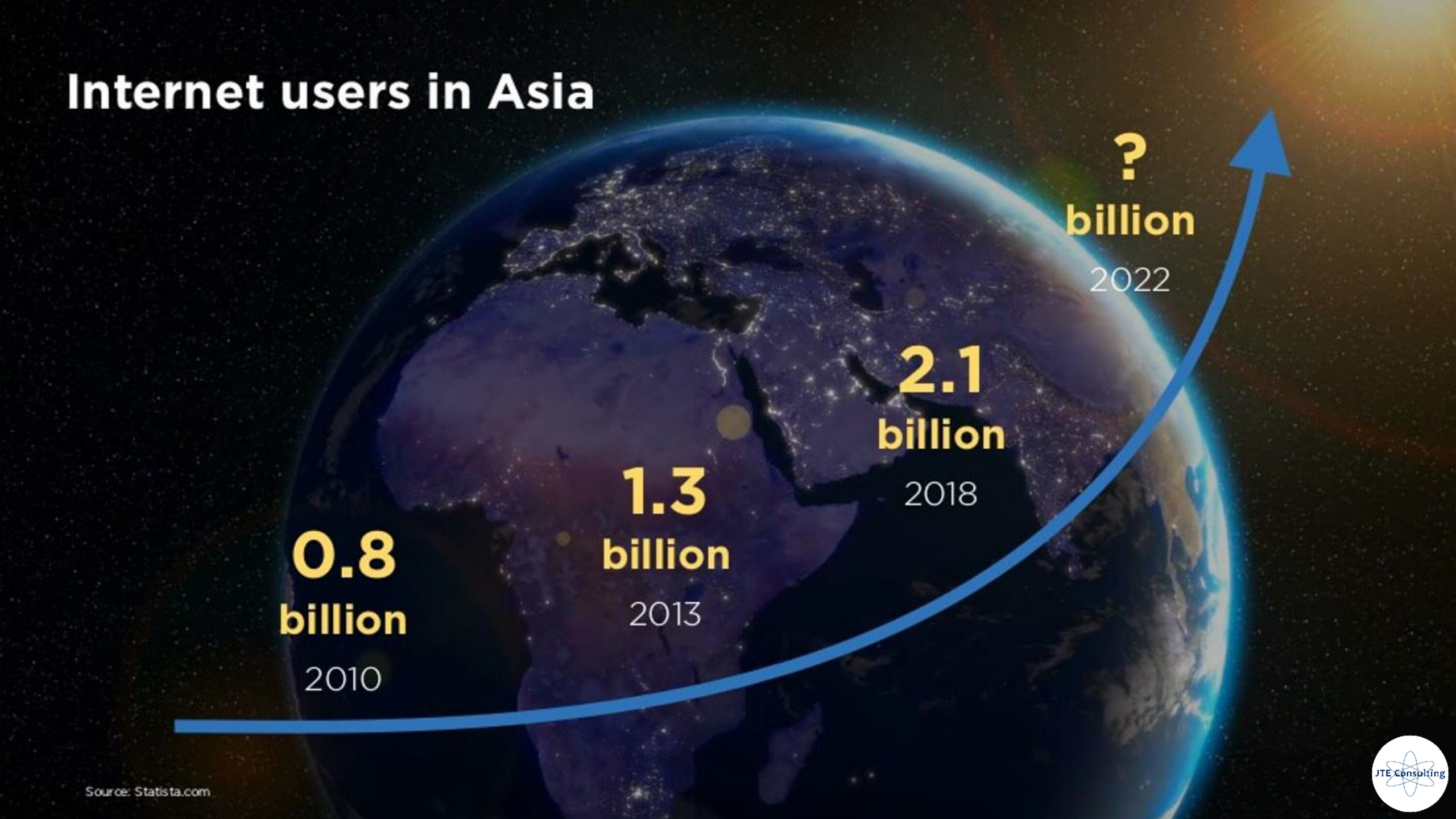
RESEARCH/LIBRARY

CLASSIFIEDS

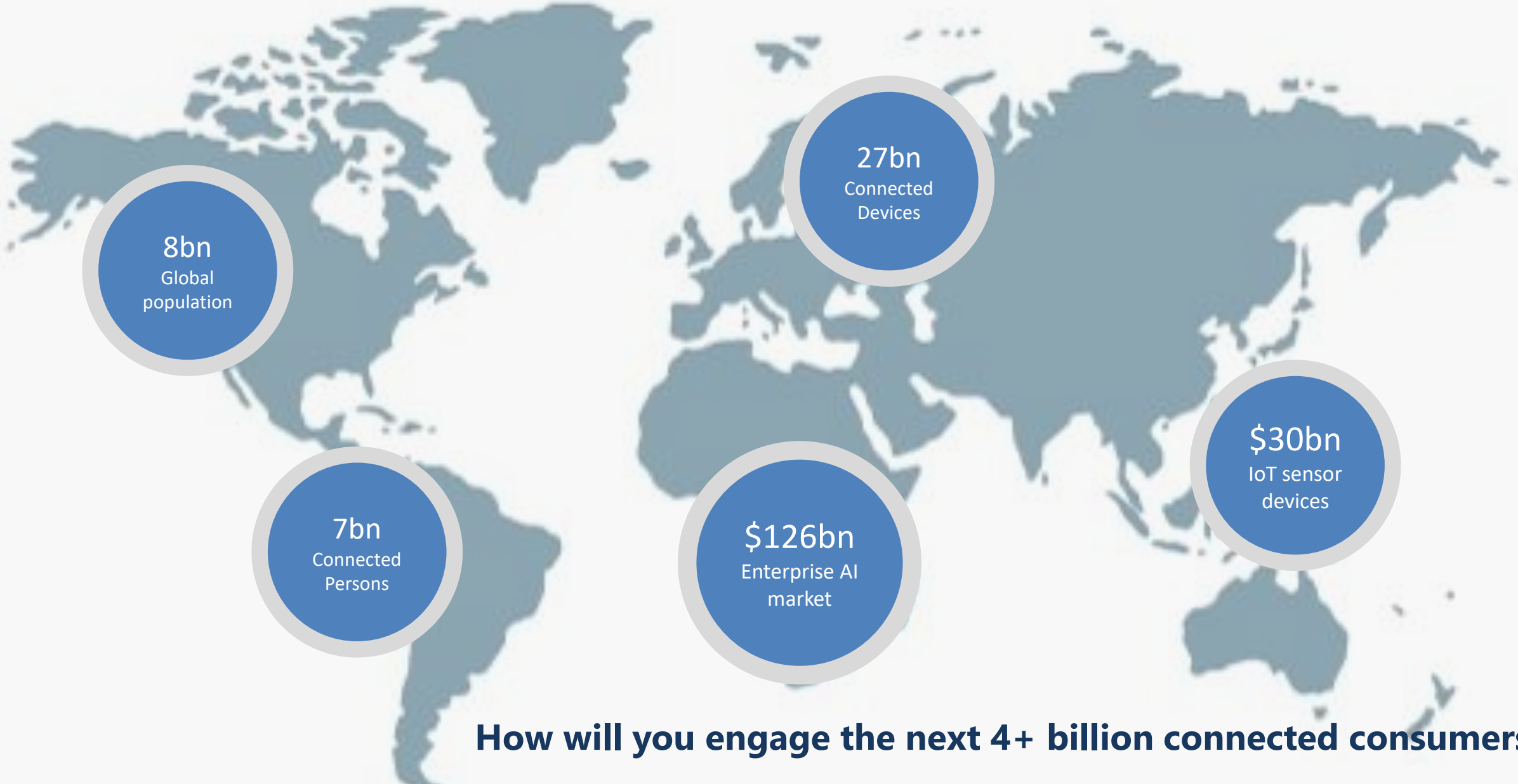
LOCAL STORES

The Forces Underpinning This

1. DIGITIZATION
2. DEMONETIZATION
3. DEMOCRATIZATION


Internet users in Asia
0.8
billion
2010
1.3
billion
2013
2.1
billion
2018
?
billion
2022
Source: Statista.com

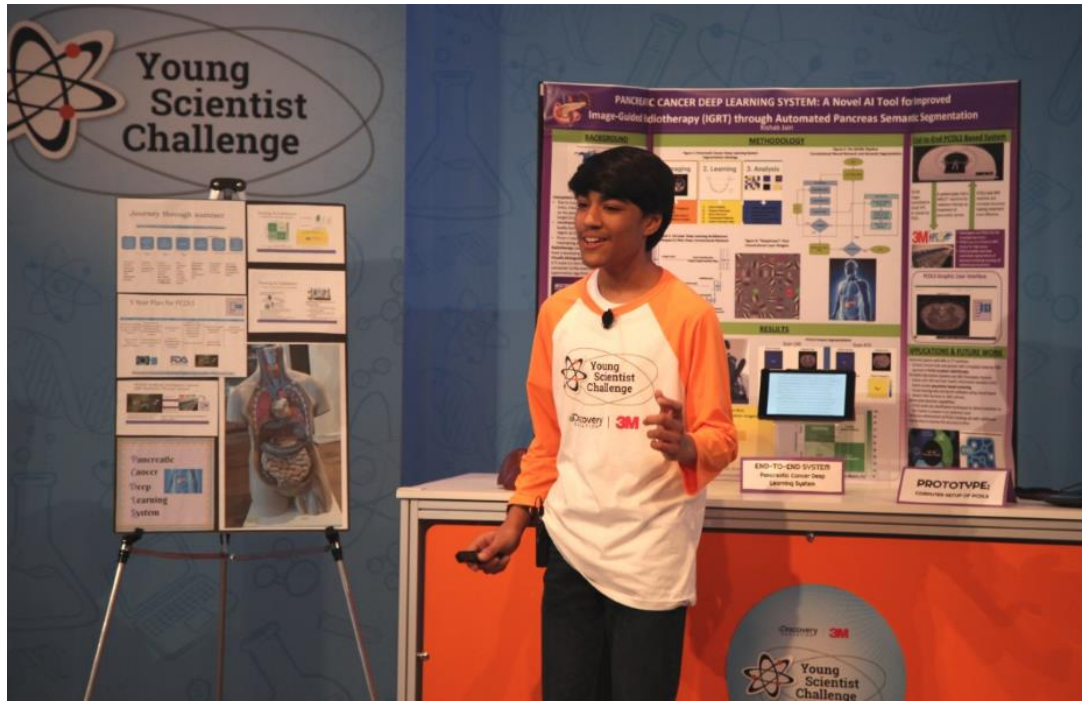
By 2025, global ubiquitous connectivity

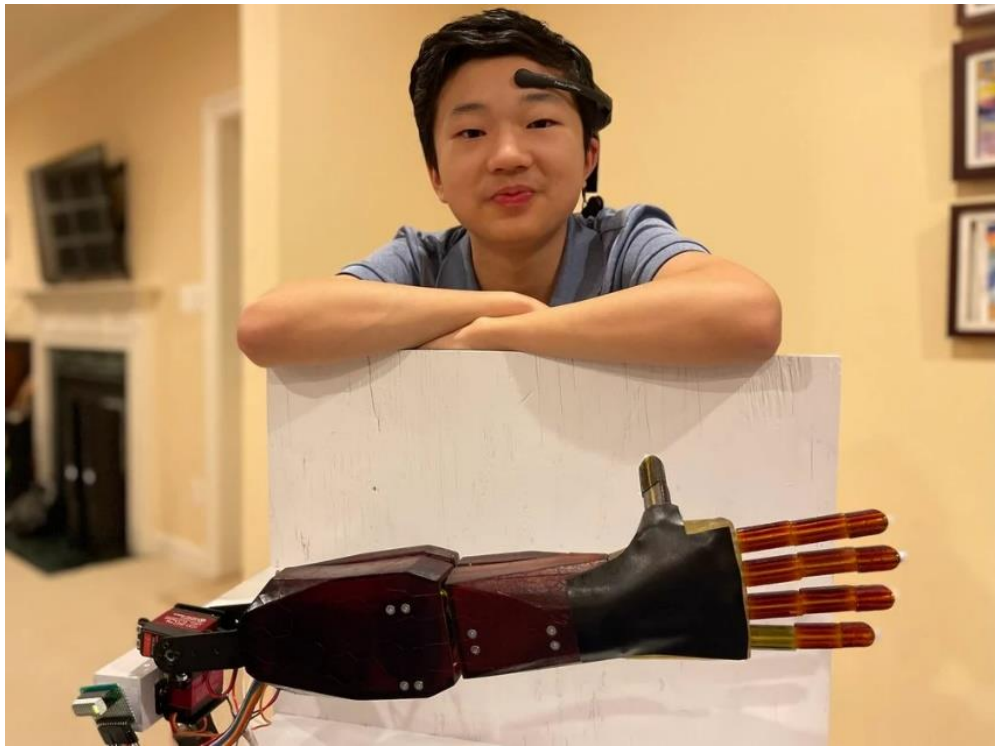


How will you engage the next 4+ billion connected consumers?

Impact comes from anyone, anywhere

This scientist invented a safer way to treat pancreatic cancer, and he hadn’t yet started high school



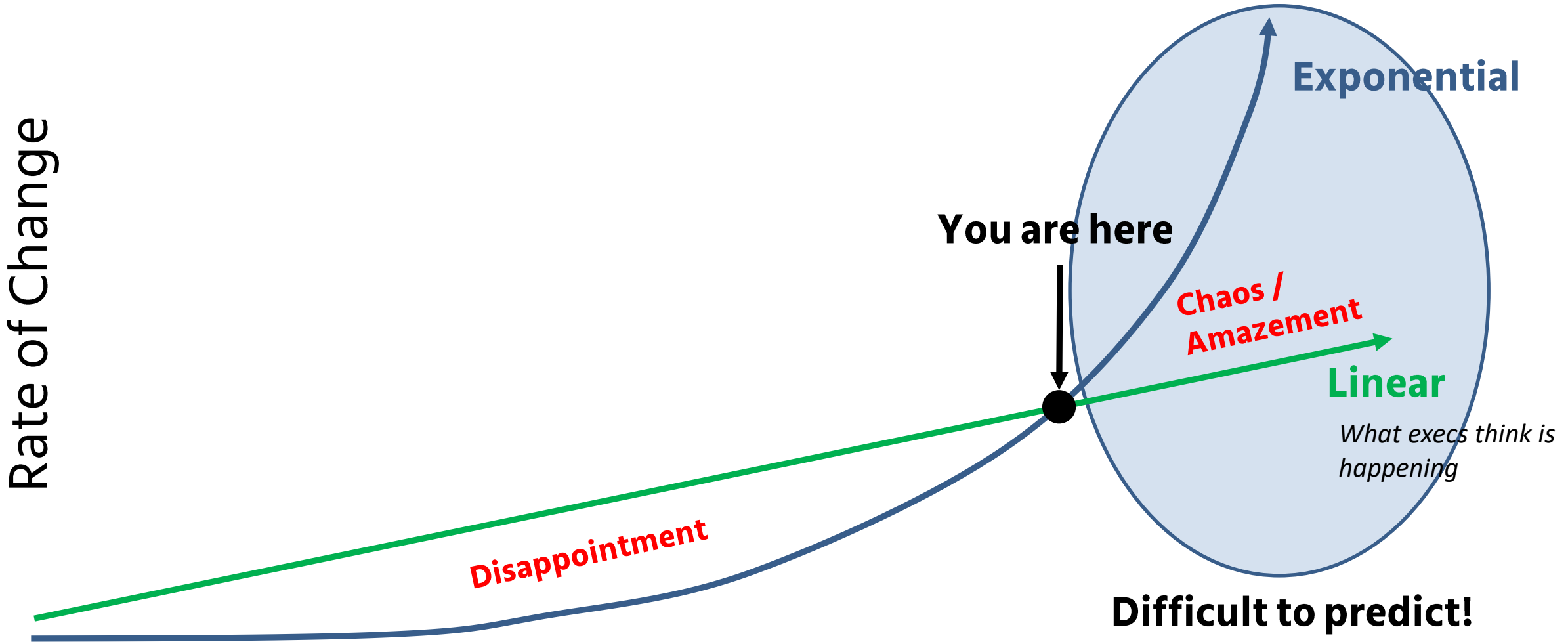


This high school student invented a low-cost mind-controlled prosthetic arm

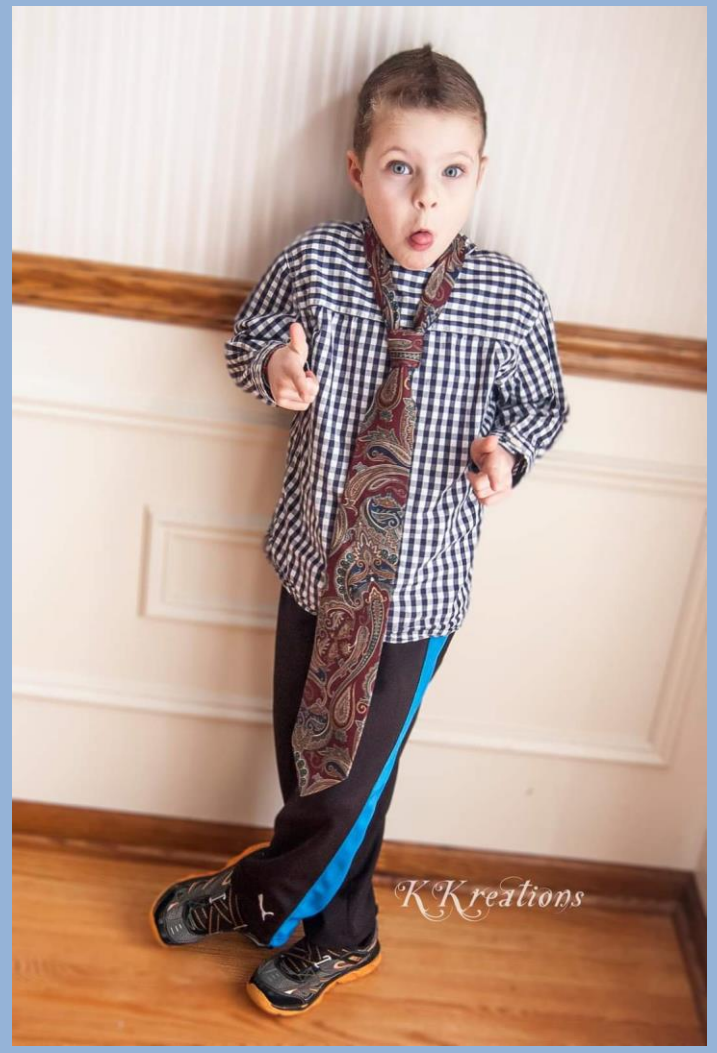
Linear vs.
Exponential thinking

JTE Consulting

The deception of Linear versus Exponential growth



Reimagining the wheat & chessboard story…



My son, John (5 years old in this picture).
Allowance: $10/week

Dad, for the next month, can I get 1 penny on day one and doubled every day after until day 31?

John – Allowance $10/week

Dad, I only want $.01/day but doubled each day for a month.

$.01 Day 1 

$.02 Day 2 

$.03 Day 3 

$164 Day 15 

$10,737,418 Day 31 

Amounts past day 3 are rounded to the dollar.

‘Expert’ Disruption Forecasts

In the mid-1980s AT&T hired McKinsey & Co to forecast cellphone adoption by the year 2000

THEIR (15-YEAR) PREDICTION

900,000

SUBSCRIBERS

THE ACTUAL NUMBER WAS

109 million

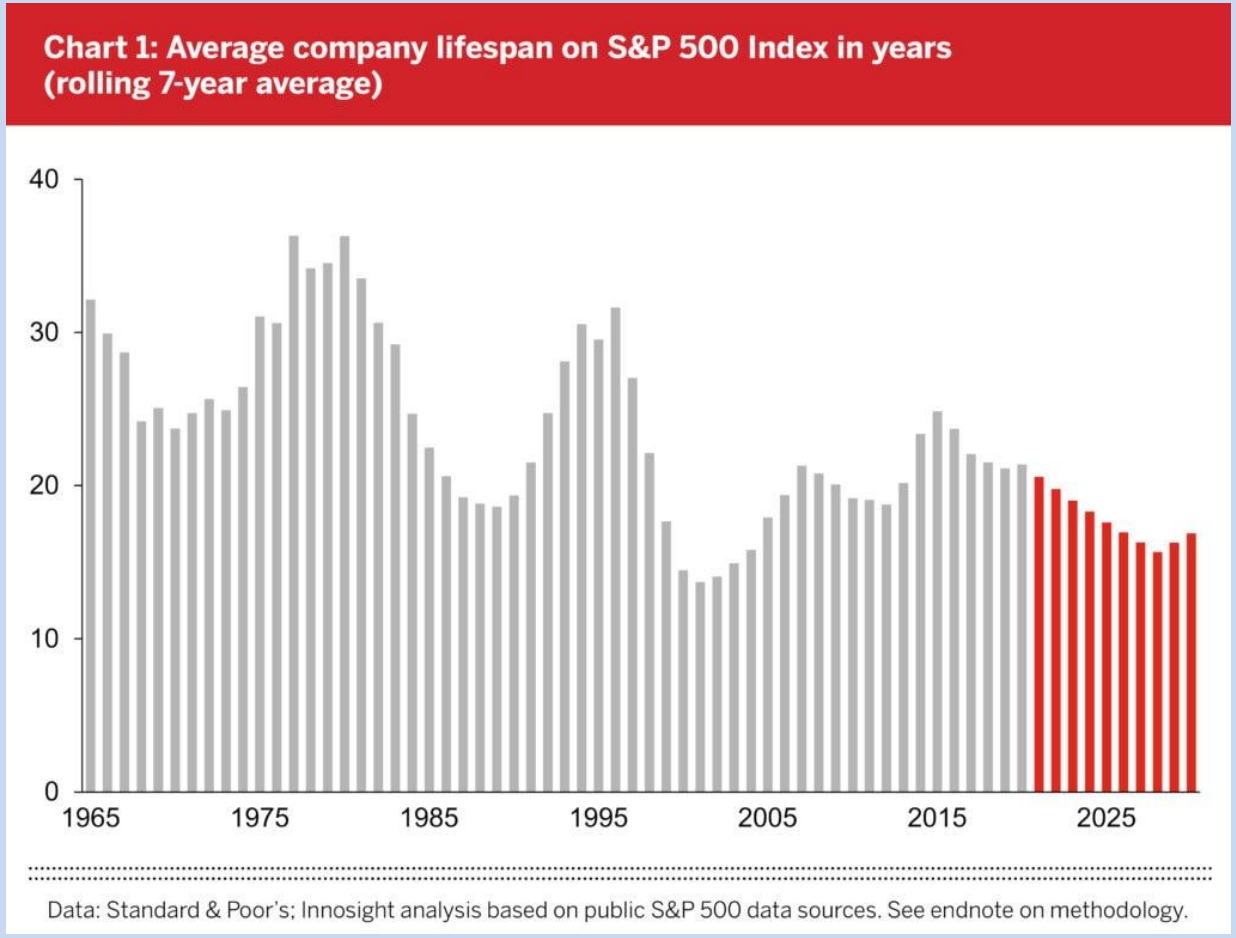
They were **off** by a factor of:

121x

JTE Consulting

TWO HANDSETS FOR EVERY PERSON ALIVE

JTE Consulting



40% of the S&P 500 won't exist by 2025.

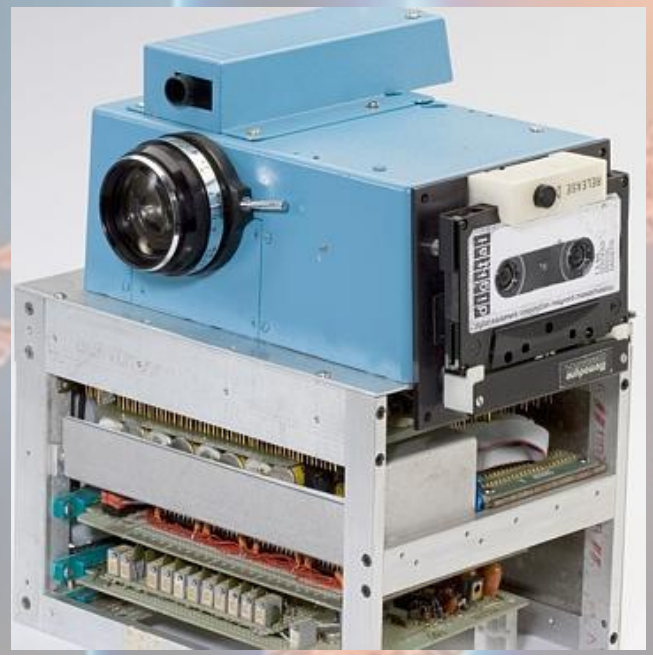
Your competition isn't just the company down the street any longer; it's companies from anywhere in the world.

JTE Consulting

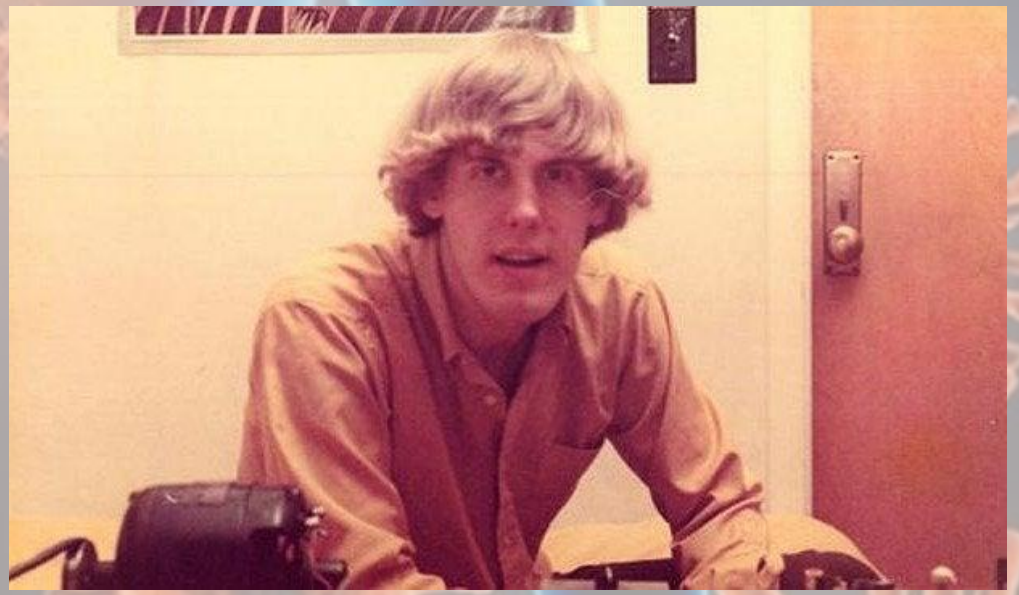
IN THE NEW WORLD,
IT IS NOT THE BIG FISH WHICH
EATS THE SMALL FISH,
IT'S THE *FAST FISH* WHICH
EATS THE SLOW FISH

Klaus Schwab

The Organization's immune system attacks innovation



In 1975, this Kodak employee invented the digital camera. His bosses made him hide it.



JTE Consulting

INSIGHTS

…in 10 years many of the major automakers will no longer be around…

pwc

"The key question is: Do you sell cars or do you sell mobility?" said Tim Ryan, New York-based vice chairman of markets and strategy for consultant PricewaterhouseCoopers LLP. "If you ignore these megatrends, you run the risk of becoming irrelevant."

BLOOMBERG Feb. 2014
"Woes of Megacity Driving Signal Dawn of 'Peak Car' Era"

"A final prediction: The era… As a result of this changing competitive landscape, we fully believe that in 10 years, many of the major automakers will no longer be around, at least not as independent companies… The companies that thrive in the future will likely be those that are nimble, future oriented—and prepared to invest in new technologies, new talent, and new strategic alliances."

KPMG SPECIAL REPORT Nov. 2015
"The Clockspeed Dilemma: What Does it Mean for Automotive Innovation?"

IBM

LOOKING AHEAD TOWARD 2025

…19% prepared for challenges…71% somewhat prepared…10% not prepared

ecosystem by 2025

PREPARDNESS FOR 2025

Only **19** percent of interviewed auto executives describe their organizations as prepared for challenges on the way to 2025; **71** percent as somewhat prepared; and **10** percent as not prepared.

Exacerbating this limited readiness, just **33** percent said their organizations are adaptable to face challenges, **59** percent are somewhat adaptable and **8** percent are

…33% adaptable to face challenges…59% somewhat adaptable…8% not adaptable

NESS VALUE Jan.

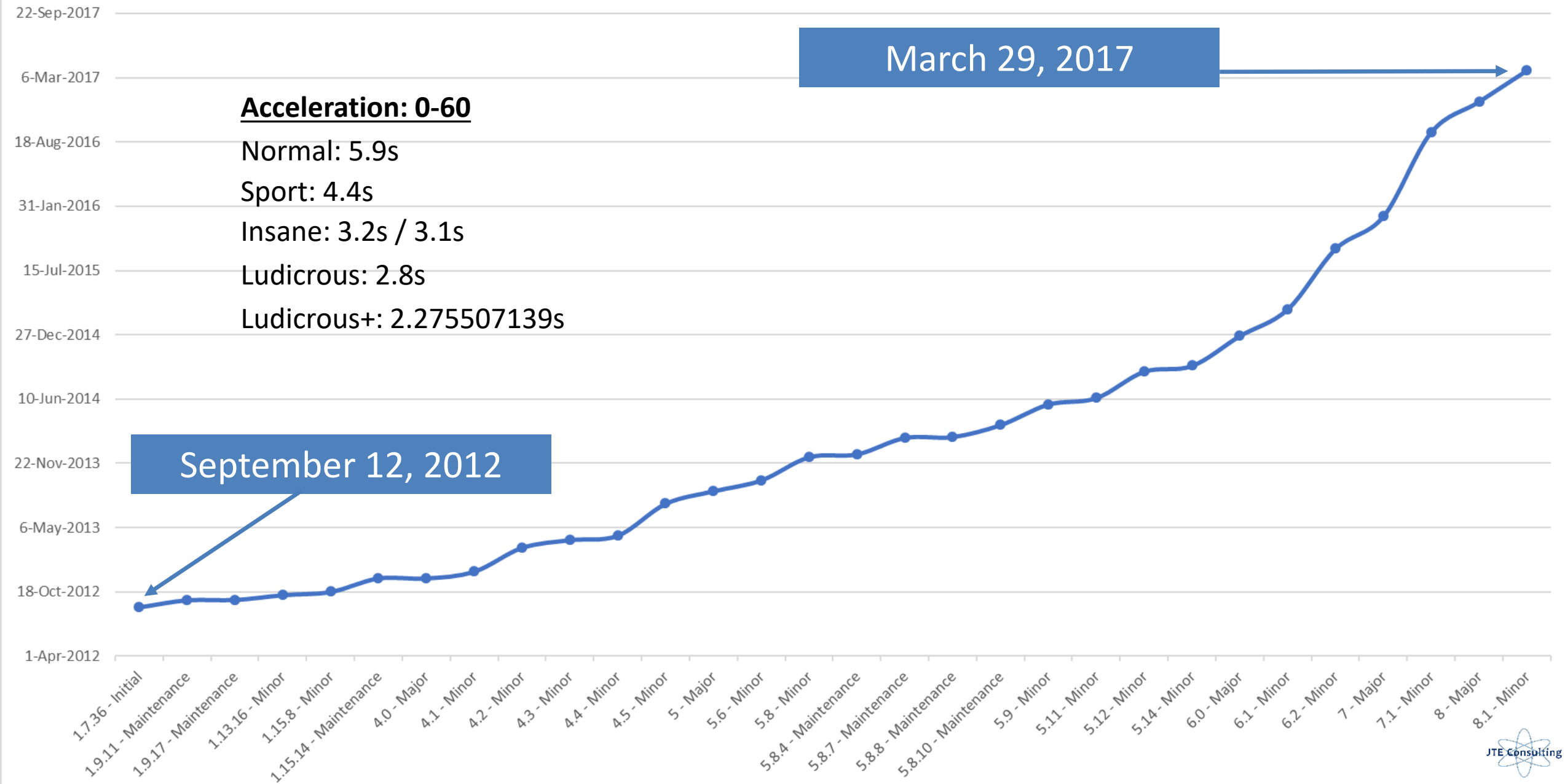
y Without Borders"

JTE Consulting

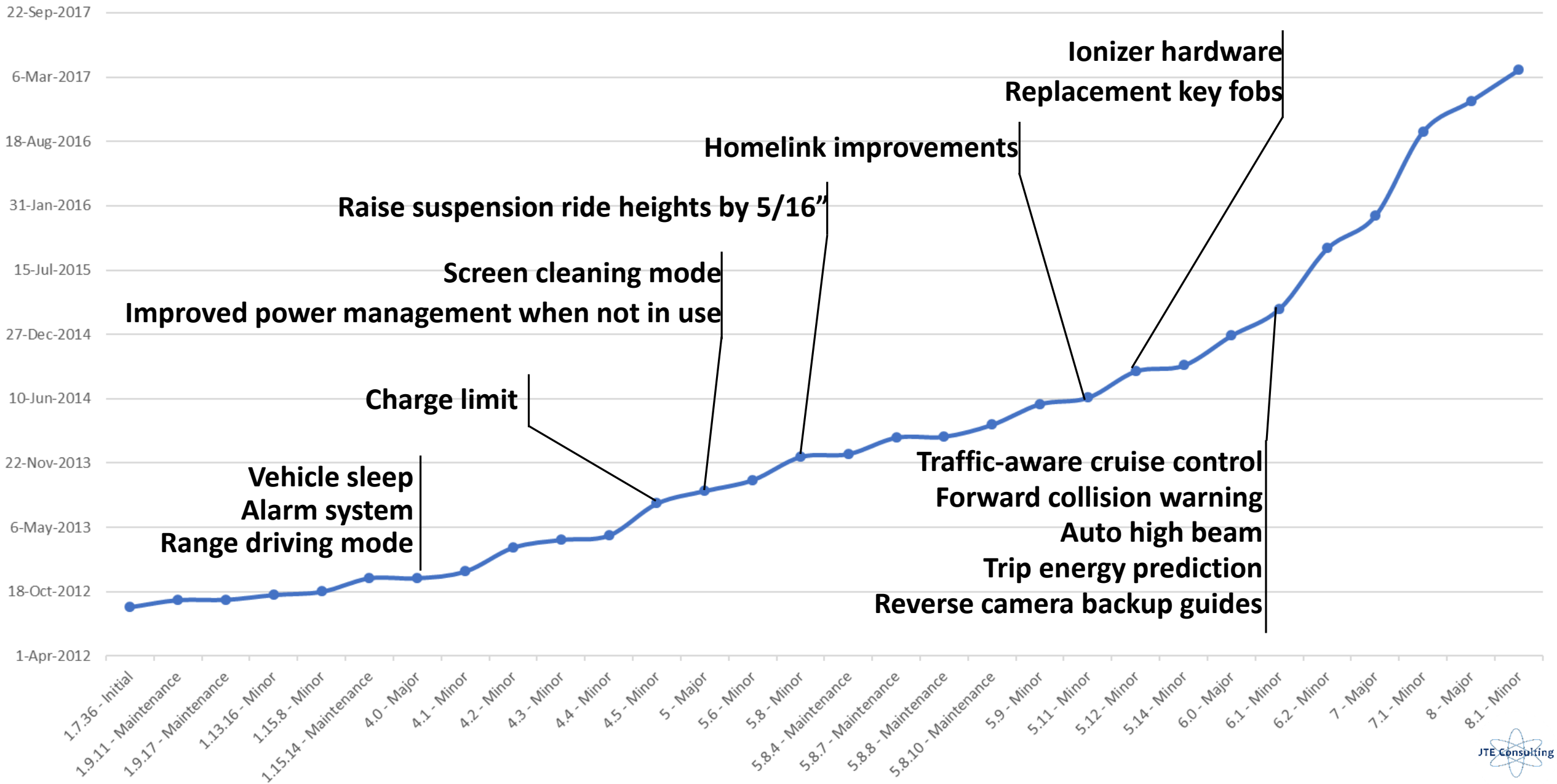

Software powers this world.
JTE Consulting


JTE Consulting

Tesla Model S Software Releases Over Time

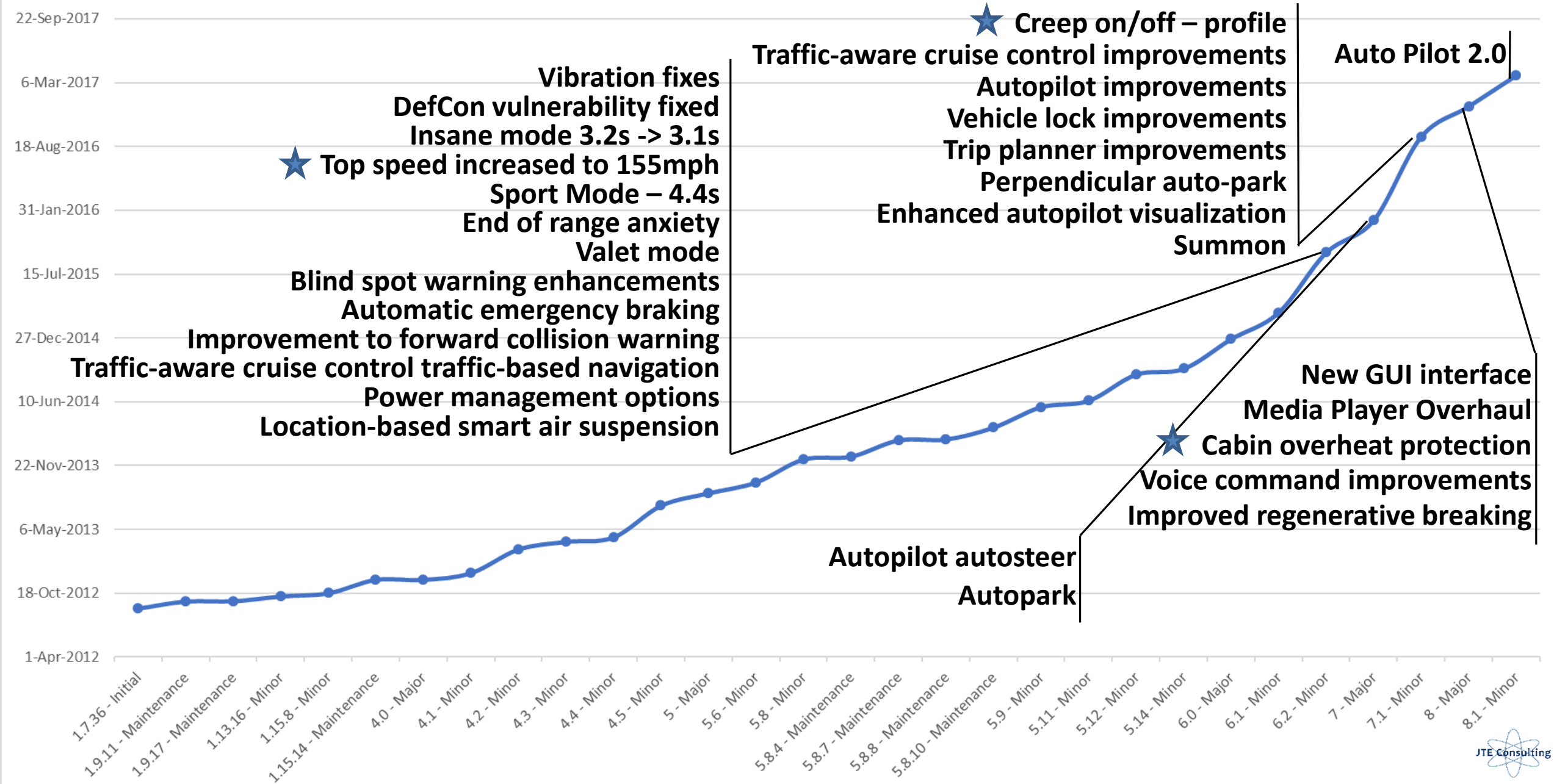


Tesla Model S Software Releases Over Time

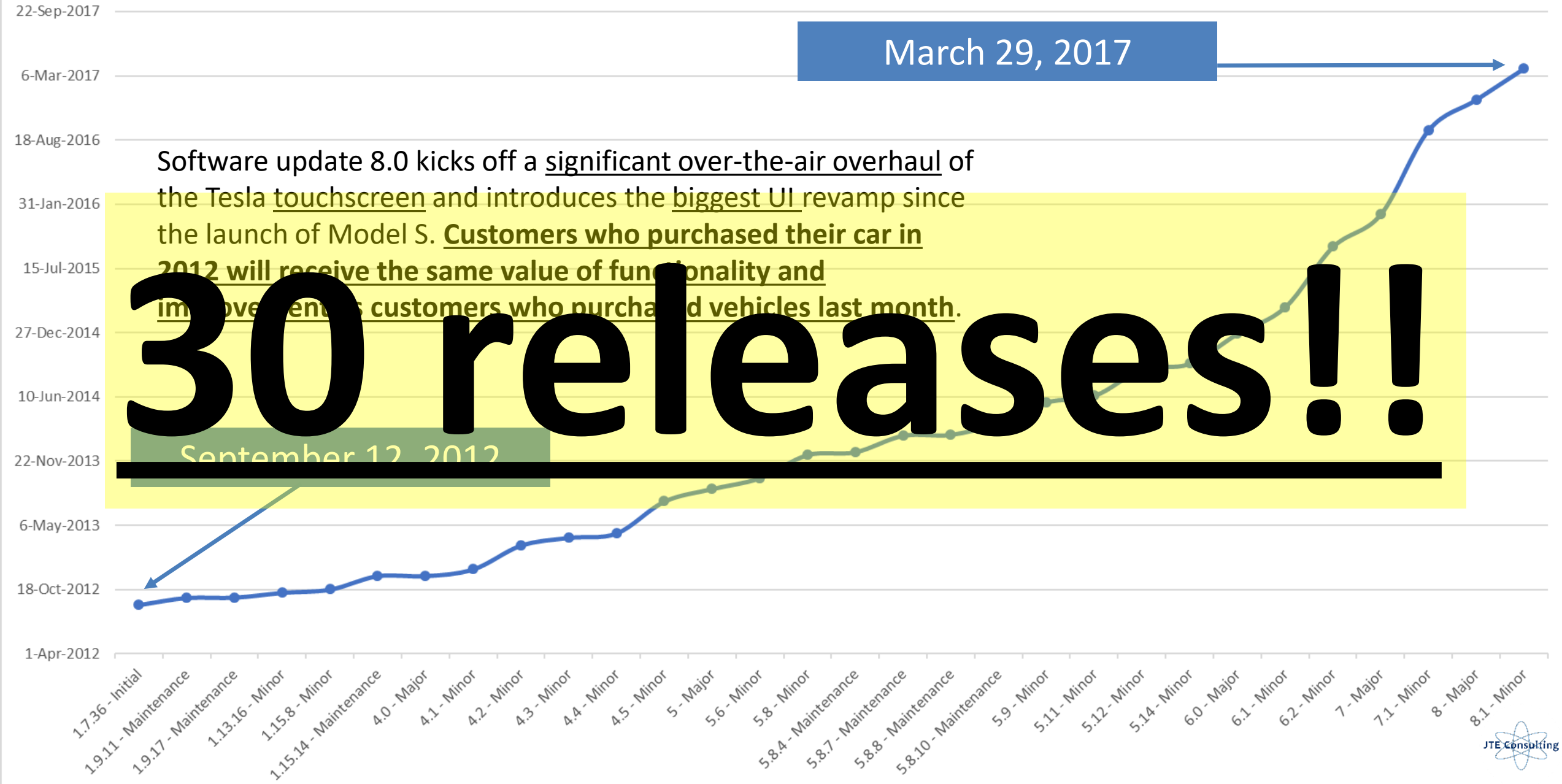


JTE Consulting

Tesla Model S Software Releases Over Time



Tesla Model S Software Releases Over Time



60 releases!!

(including Joe Mode in version 10.0)

JTE Consulting

Upgrade Infotainment

All Model S’s

$2000

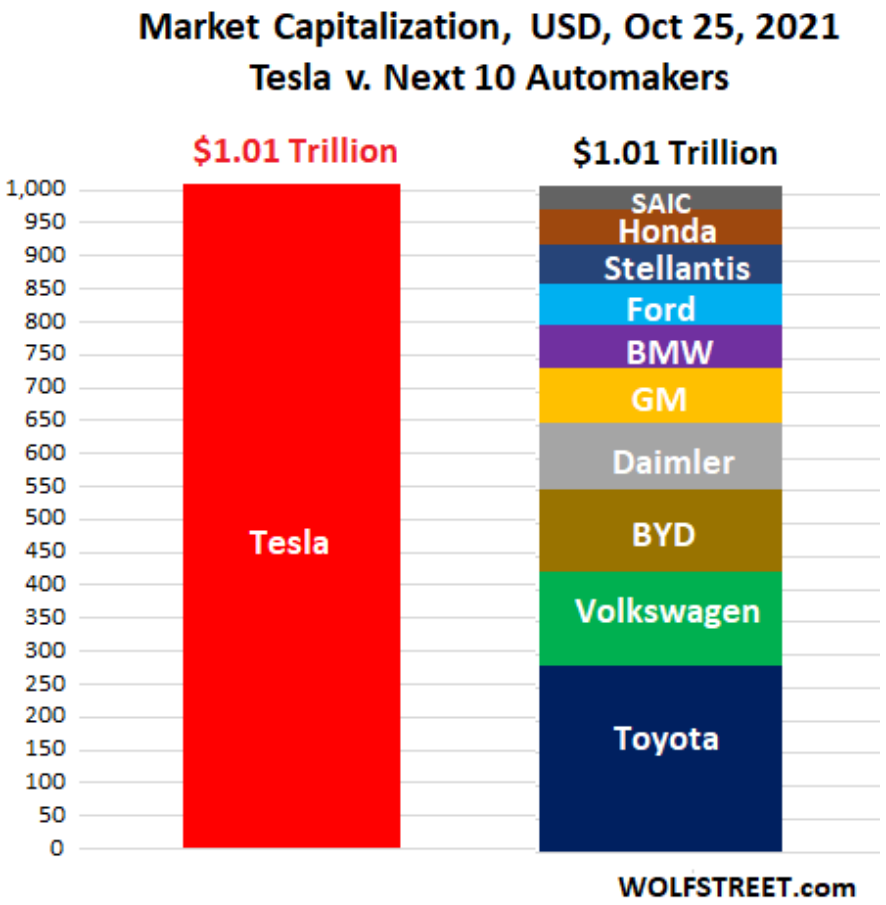
JTE Consulting

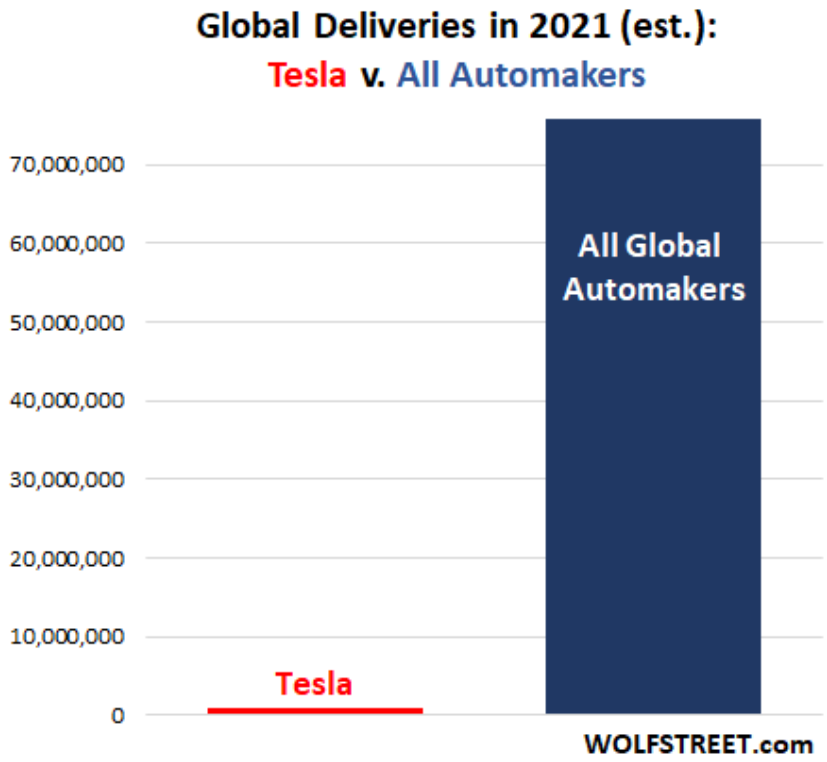
Our industry does not respect tradition – it only respects innovation.

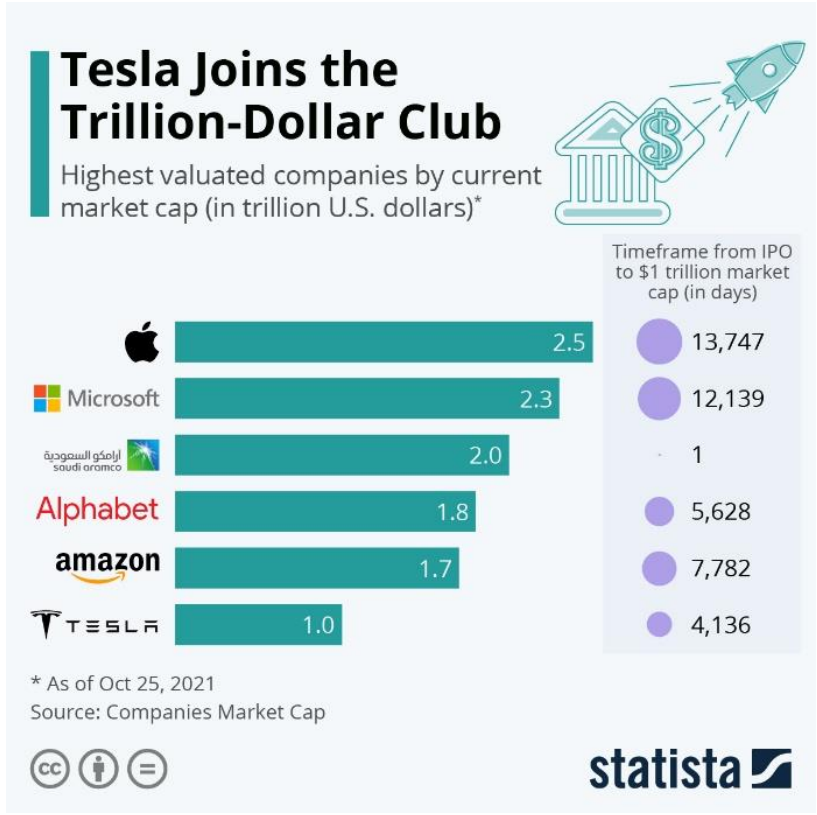
Satya Nadella


Are you sure you want to push the limits?
This will cause accelerated wear of the motor, gearbox and battery.
No, I want my Mommy
Yes, bring it on!
P100D+

Software is Where the Value Is Found







What is your definition of success?

JTE Consulting

Good
software,
like wine,
takes time.

Joel Spolsky

Easter Morning

1900

5th Avenue

New York, NY

JTE Consulting

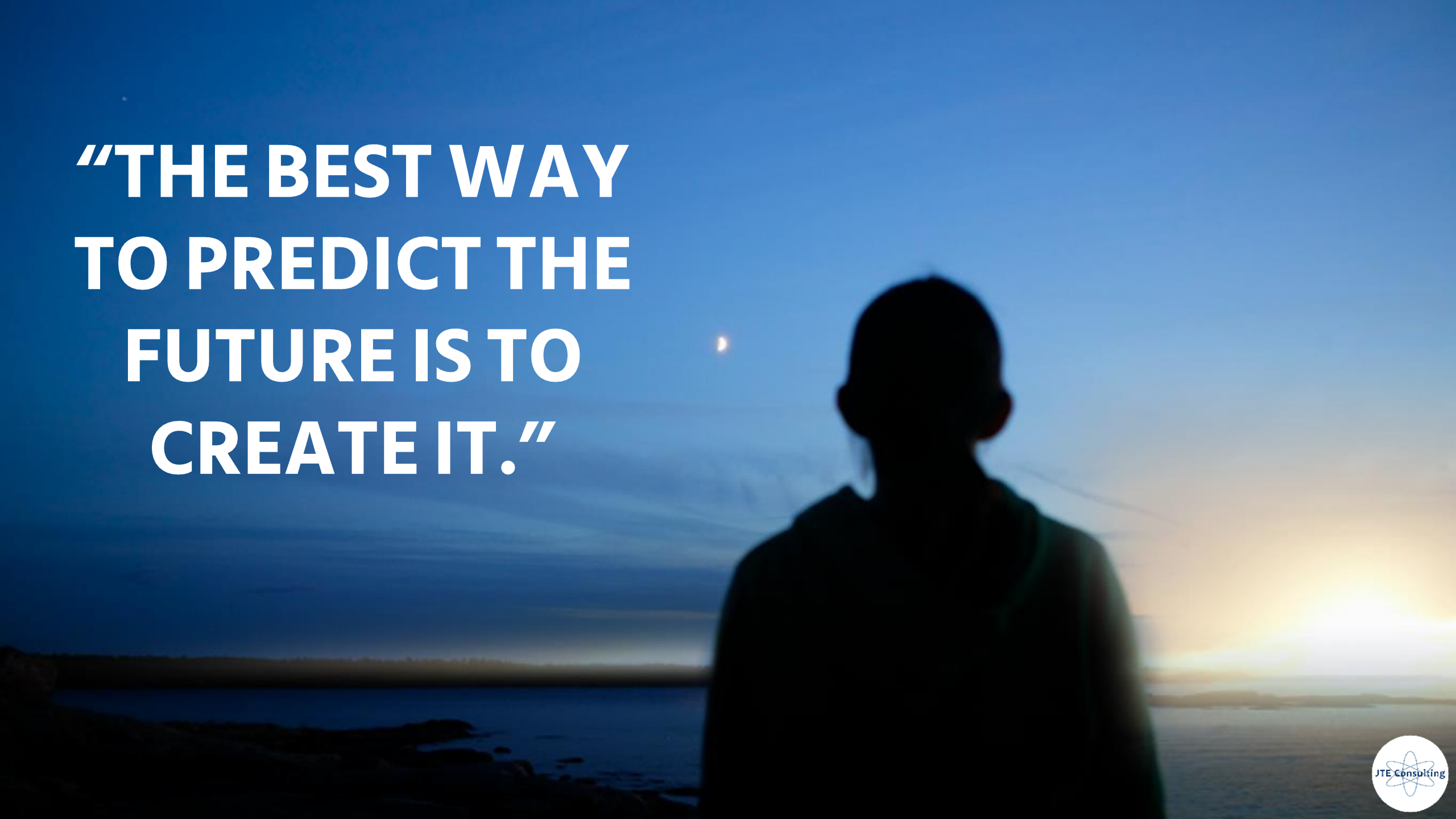
Easter Morning

1913

5th Avenue

New York, NY

JTE Consulting


“THE BEST WAY TO PREDICT THE FUTURE IS TO CREATE IT.”
JTE Consulting

Q&A

We are leaders in risk, strategy and people. One company, with four global businesses, united by a shared purpose to make a difference in the moments that matter.

Marsh GuyCarpenter Mercer OliverWyman

JTE Consulting

Information Cited in Marsh McLennan Manufacturing and Automotive Summit Keynote

Virtual

September 21, 2022

Slide 2

My background including education and work history can be found on my LinkedIn page @ https://www.linkedin.com/in/johntellis. You can also read more about my work and publications @ www.johntellis.com.

Slide 3

Image of Andy Grove taken from here: https://newsroom.intel.com/biography/andrew-s-grove/. His book *Only the Paranoid Survive: How to Exploit the Crisis Points That Challenge Every Company* can be found here: https://www.amazon.com/Only-Paranoid-Survive-Exploit-Challenge/dp/0385483821.

Slide 4

Image of Yogi Berra taken from here: https://www.goalcast.com/15-funny-yogi-berra-quotes/. His quote (and the history of his life) can be found here: https://en.wikiquote.org/wiki/Yogi_Berra.

Slide 5

David Rose quote is from his 2014 book *Angel Investing: The Gust Guide to Making Money and Having Fun Investing in Startups* found here: https://www.amazon.com/Angel-Investing-Making-Having-Startups/dp/1118858255.

Slide 6

One perspective on emerging disruption technologies can be found here: https://www.pwc.co.uk/issues/intelligent-digital/disruptive-innovation-emerging-technology.html (accessed on May 9, 2021). The images used for this graphic can be found as follows:

Nanotechnology – https://www.europarl.europa.eu/resources/library/images/20200611PHT81012/20200611PHT81012-ml.jpg
Internet of Things – https://www.mining-technology.com/wp-content/uploads/sites/19/2021/10/Internet-of-Things-Technology-Trends.jpg
Robotics – https://images.idgesg.net/images/article/2018/10/ai_robotics_analytics_data-scientist_mathematics_equation-100777424-large.jpg
3D Printing – https://constructionblog.autodesk.com/wp-content/uploads/2020/08/3d-printing-in-the-construction-industry.jpg
Digital Biology – https://biotechscope.com/wp-content/uploads/2019/06/mobile2.jpg
Autonomous Vehicles – https://www.cio.com/wp-content/uploads/2021/12/automotive_connected_smart_car_autonomous_vehicle_gui_hud_thinkstock_861086772-100749780-orig.jpg?quality=50&strip=all

Immersive Reality – https://www.6gworld.com/wp-content/uploads/2020/11/shutterstock_445257469-scaled.jpg
Blockchain – https://blogs.iadb.org/caribbean-dev-trends/wp-content/uploads/sites/34/2017/12/Blockchain1.jpg
Artificial Intelligence – https://www.softwareone.com/-/media/global/social-media-and-blog/hero/implementing-artificial-intelligence-part-1-hero.jpg?rev=56ebf75efd06466786861433a1cae008&sc_lang=hu-hu&hash=BB0B197D8F1E5BD3D11B11556A5383E7

Slide 7

The flat icons were all sourced from flaticon.com. The chosen industries are merely representative for this presentation. Every industry is undergoing technology disruption of some kind.

Slides 8, 13, and 16

These 3 forces are taken from the 6 D's of technology disruption introduced by Peter Diamandis in 2016. You can read more about Diamandis' insights here: https://www.diamandis.com/blog/the-6ds.

Slide 9

The evolution of the desk image is taken from here: https://womenyoushouldknow.net/wp-content/uploads/2014/09/the-evolution-of-the-desk-1980-2.jpg.

This same site hosts a time lapse video of the evolution of the desk from 1981 to 2014: https://womenyoushouldknow.net/evolution-desk-time-lapse-video-technology-transformed-office-space/.

Slide 10

The Samsung mobile device image is taken from here: https://www.wired.com/story/samsung-galaxy-s22-galaxy-tab-s8-series/.

Slide 11

The image of Apollo 11 astronaut Buzz Aldrin on the moon is found here: https://cdn.mos.cms.futurecdn.net/3CorBj4FSCunixkTsDZy5L.jpg.

The comparison of a modern-day mobile device (e.g., iPhone6 to the NASA computers used for the Apollo 11 moon landing) is found here: https://www.zmescience.com/science/news-science/smartphone-power-compared-to-apollo-432/.

The image of the Houston control room for the Apollo 11 mission is found here: https://gucki.it/wp-content/uploads/2019/06/mission-control-room-nasa-apollo-houston-gucki.jpg.

The image of the Samsung s22 home screen is from my own device.

Slide 12

The background image is taken from this article: https://www.synthego.com/blog/scale-in-biology. The direct link to the image: https://images.contentstack.io/v3/assets/blte41c17d7f8dda379/blt821dd56edf4674cd/5f4ee00a99431928ffc0e725/5_Factors_Transforming_the_Value_of_Scale_in_Biology.jpg.

The article on the brain linked to the internet is found here: https://futurism.com/researchers-have-linked-a-human-brain-to-the-internet-for-the-first-time-ever.

The article on connecting 3 brains to share thoughts is found here: https://www.sciencealert.com/brain-to-brain-mind-connection-lets-three-people-share-thoughts.

The article on the first CRSPR gene-edited babies is found here: https://getanimated.uk.com/meet-lulu-and-nana-the-worlds-first-crispr-genome-edited-babies/.

The article on the brain controlling table for paralyzed people is found here: https://www.sciencedaily.com/releases/2018/11/181121142420.htm.

The image showing the 2 paralyzed persons controlling tables is found here: https://lifezest.co/wp-content/uploads/2019/01/2019-01-06-09_25_07.jpg.

Slide 18

The statistics can be found at the following locations:

- https://en.wikipedia.org/wiki/Projections_of_population_growth
- https://cybersecurityventures.com/how-many-internet-users-will-the-world-have-in-2022-and-in-2030/
- https://iot-analytics.com/number-connected-iot-devices
- https://www.statista.com/statistics/607716/worldwide-artificial-intelligence-market-revenues/
- https://www.marketsandmarkets.com/Market-Reports/sensors-iot-market-26520972.html

Slide 19

You can find the picture and story of Rishab Jain here: https://physicsworld.com/a/americas-top-young-scientist-uses-ai-to-improve-pancreatic-radiotherapy/.

The picture and article on the low-cost prosthetic arm are found here: https://www.smithsonianmag.com/innovation/this-high-schooler-invented-a-low-cost-mind-controlled-prosthetic-arm-180979984/.

Slide 21

Other variants of this slide can be found at the following links:

https://finstart.co/coronavirus-proves-we-dont-understand-exponential-growth/

https://singularityhub.com/2016/04/05/how-to-think-exponentially-and-better-predict-the-future/linear-versus-exponential-2/

https://evolutionpartners.com.au/exponential-growth-vs-linear-thinking-in-management-teams.html

Slides 22-23

The wheat and chessboard problem is described in this Wikipedia article: https://en.wikipedia.org/wiki/Wheat_and_chessboard_problem. This same article describes the problem in modern day language using money.

Slide 24

The Motorola Dynatac mobile phone image comes from here: https://p.turbosquid.com/ts-thumb/s7/5TGceD/4c/motorola_dynatac_8000x_vintage_mobile_phone_360/jpg/1633039735/600x600/turn_fit_q87/830759cd39b93bbf0427ff0bf58b826715ca8d8f/motorola_dynatac_8000x_vintage_mobile_phone_360-1.jpg.

The following articles present in different detail the story of the McKinsey consulting company and their estimate of the mobile market study for AT&T in the early 1980's:

- https://story.fund/post/118066999007/mckinsey-estimates-of-the-cell-phone-market
- https://skeptics.stackexchange.com/questions/38716/did-mckinsey-co-tell-att-there-was-no-market-for-mobile-phones
- https://www.upf.edu/web/angel-lozano/innovation/-/asset_publisher/AZaAOTtL3c4Z/content/id/223464268/maximized
- https://dealbook.nytimes.com/2013/09/02/in-a-new-book-mckinsey-co-isnt-all-roses/
- https://www.economist.com/special-report/1999/10/07/cutting-the-cord

Slide 25

Image created by Motorola Mobility Devices in 2008. No attribution available.

Slide 26

The lifespan of companies on the S&P 500 is discussed here: https://www.innosight.com/insight/creative-destruction/.

Slide 27

The image of Klaus Schwab (Founder and Executive Chairman, World Economic Forum) is taken from here: https://s.wsj.net/public/resources/images/BN-EI840_schwab_FR_20140902124907.jpg.

The story of his quote and his analysis can be found here: https://www.weforum.org/agenda/2015/02/are-you-ready-for-the-technological-revolution/.

Slide 28

The background image of this slide is taken from here: https://trialsitenews.com/wp-content/uploads/2020/05/TrialSite-News-Website-Image-15.jpg.

You can read more about the Kodak employee and find the images here: https://lens.blogs.nytimes.com/2015/08/12/kodaks-first-digital-moment/?mcubz=1.

Slide 29

PWC quote: https://www.bloomberg.com/news/articles/2014-02-24/woes-of-megacity-driving-signals-dawn-of-peak-car-era.

KMPG quote: https://www.kpmg-institutes.com/content/dam/kpmg/advisory-institute/pdf/2015/clockspeed-dilemma.pdf. (page 25)

IBM quote: https://www.ibm.com/thought-leadership/institute-business-value/report/auto2025 (study website) // https://www.ibm.com/downloads/cas/4JEQ0DN1 (specific download report). (page 4)

Slide 30

The image is taken from here: https://www.iea.org/topics/world-energy-outlook. The statement is my own.

Slide 31

Image of the Tesla product line up is taken from here: https://www.teslarati.com/wp-content/uploads/2018/08/Tesla-S3X-Semi-fleet-press-photo-e1548882286108.jpg.

Slides 32-36

The history of Tesla software releases since 2012 can be found in the following locations:

- https://teslamotorsclub.com/tmc/threads/model-s-software-firmware-changelog.10820/
- https://www.reddit.com/r/teslamotors/wiki/softwareupdates
- https://finance.yahoo.com/news/tesla-model-electric-car-software-changes-since-2012-110000883.html
- https://www.quora.com/Since-Teslas-get-updated-software-daily-Do-all-Tesla-cars-get-the-same-updates-regardless-of-what-year-they-were-made-Does-a-2012-Tesla-have-the-same-exact-software-as-a-2018-Tesla

The description of Joe Mode in software release 10.0.0 is found here: https://www.tesla.com/support/software-version-10-0.

Slide 37

The image of the 2012 Tesla Model 2 dashboard and infotainment unit is taken from here: https://pictures.topspeed.com/IMG/crop/201112/2012-tesla-model-s-alpha-5_1600x0w.jpg.

You can read about Tesla's infotainment upgrade program, including cost details, here: https://www.tesla.com/support/infotainment.

Slide 38

The image of Satya Nadella (CEO, Microsoft) is taken from here: https://upload.wikimedia.org/wikipedia/commons/thumb/7/78/MS-Exec-Nadella-Satya-2017-08-

31-22_%28cropped%29.jpg/1200px-MS-Exec-Nadella-Satya-2017-08-31-22_%28cropped%29.jpg.

His quote citation can be found in the email that is included in this 2014 PC World article: https://www.pcworld.com/article/443615/our-industry-does-not-respect-tradition-ceo-satya-nadellas-email-to-microsoft-employees.html.

Slide 39

Screen shot of turning on the Tesla P100D+ Ludicrous Plus+ mode taken from here: http://www.dragtimes.com/blog/tesla-p100d-ludicrous-plus.

The description of the feature is found here: https://www.autotrader.com/car-shopping/ludicrous-mode-ludicrous-plus-mode.

Slide 40

The Wolfstreet images can be found in this article: https://wolfstreet.com/2021/10/26/teslas-market-cap-gigantic-v-next-10-automakers-v-teslas-global-market-share-minuscule/.

The Statista image can be found in this article: https://www.statista.com/chart/26061/highest-valuated-companies-by-current-market-cap/.

Slide 41

The image of Joel Spolsky along with his bio can be found here: https://www.joelonsoftware.com/publicity-information-for-joel-spolsky/.

Joel's quote believed to have been made in 2017: https://twitter.com/codewisdom/status/898671626924941312.

Slides 42-43

Pictures taken from here: http://www.businessinsider.com/5th-ave-1900-vs-1913-2011-3.

Slide 44

History of the quote can be found here: http://quoteinvestigator.com/2012/09/27/invent-the-future/. The specific language is attributed to Alan Kay.

Additional Reference Material for Consideration

1. The following are references for further reading of the automotive software ecosystem.
    a. https://www.baystreet.ca/articles/research_reports/edison/Automotiveecosystem092917.pdf
    b. https://www.radiofreemobile.com/research-publication-automotive-ecosystems-sitting-ducks-thematic-update/
    c. https://www.radiofreemobile.com/category/ecosystems/
2. Elon Musk has been clear as to what his plan was with Tesla since 2006. That plan can be found in his manifesto: https://www.tesla.com/blog/secret-tesla-motors-master-plan-just-between-you-and-me.
3. Bob Lutz (former GM executive) comment on "why can a California start-up that knows nothing about cars do this and we cannot?" can be found in this New Yorker magazine article: https://www.newyorker.com/magazine/2009/08/24/plugged-in.
4. "Silicon foolishness" and how that is at the heart of Tesla's success is better explained here: https://www.forbes.com/sites/xseedcapital/2015/09/16/elon-musk-demonstrates-the-benefits-of-being-considered-foolish/?sh=111f33b96f48.
5. The chip shortage is not affecting Tesla the same as other automotive OEMs because Tesla controls their software. You can read about this here https://www.nytimes.com/2022/01/08/business/teslas-computer-chips-supply-chain.html, here https://www.theverge.com/2021/7/26/22595060/tesla-chip-shortage-software-rewriting-ev-processor, and here https://www.wsj.com/articles/how-elon-musks-software-focus-helped-tesla-navigate-chip-shortage-11640860208.
6. Additional reading on Tesla's impact to the automotive industry can be found in the following articles:
    a. https://evannex.com/blogs/news/automakers-taking-another-page-from-tesla-s-book
    b. https://insideevs.com/news/563996/tesla-beats-chip-shortage-software/
    c. https://blacklab.design/in-house-design-tesla-advantage/
    d. https://www.cnbc.com/2018/06/22/what-is-tesla-mos-software-employee-allegedly-hacked.html
    e. https://seekingalpha.com/article/4123319-tesla-is-software-company
    f. https://www.reuters.com/business/autos-transportation/build-or-buy-automakers-chasing-tesla-rethink-dependence-suppliers-2022-03-31/
7. Tesla customers who knowingly accept the "issues" from Tesla (and in fact are leaving Toyota (for example) to Tesla in spite of the issues) is best encapsulated here https://cleantechnica.com/2018/09/01/tesla-has-applied-agile-software-development-to-automotive-manufacturing/.
8. Tesla makes available an overview of its factory approach (including the use of in-house software development) here https://electrek.co/2021/10/20/tesla-launches-new-website-manufacturing-muscle-hiring-effort/.