Smart Mobility
- 자율주행 시대, 우리는 무엇을 보아야 하는가? -

October 5, 2018

Dr. Joonwoo Son, CEO @ Sonnet.AI & DGIST, KOREA

Inventing the future of Autonomous Cars & AI

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Solutions for Autonomous Driving

The Gold Rush

- In the 1840's, lots of people moved to California looking for gold.
- Blue jeans were invented in California to sell to gold miners.
- We became a part of the USA in 1850.

(Source: www.slideshare.net/teacher2011)

Automotive News

Self-Driving Technology is the Next Gold Rush!

Auto Drive
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Agenda

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㈜소네트 기업 개요

- ㈜소네트는 DGIST(대구경북과학기술원) 연구원 창업 1호 기업
- 소네트(Sonnet)는 엄격한 운율 구조를 따르는 14행으로 이루어진 정형시
- ㈜소네트는 "시를 쓴다는 마음" 으로 복잡한 시스템을 최적화하고 정형화된 개발 프로세스를 적용하여 혁신성과 신뢰성을 갖춘 글로벌 리딩 테크놀로지를 실현하는 것을 목표로 함
- 홈페이지: www.sonnet.ai / auto-drive.net

중앙일보

자율주행 스타트업 소네트...중소기업 첫 임시운행 허가

[뉴시스] 입력 2018.05.03 11:00

최희정 기자 = 우리나라 자율주행 개발에 중소기업도 뛰어들 수 있게 된다.

자율주행 인공지능 전문 스타트업 소네트의 자율주행차에 행을 허가했다고 3일 밝혔다.

자체 개발한 부품을 사용해 자율주행차 임시운행허가를 받은 처음이다.

시운행을 허가받으면서 45대의 자율주행차가 전국을 주행할 수

주요 연혁

- 2018. 07. 인공지능 기반 자율주행 국제 특허 출원 (미국, 유럽)
- 2018. 05. 국토교통부 자율주행임시운행 허가 획득
- 2018. 04. 자율주행 소프트웨어 개발 실무 교육 실시
- 2018. 04. 한국기계연구원 실차 실험 관련 연구 용역 수주
- 2018. 03. "AutoDrive" 상표 출원 완료
- 2018. 02. 프랑스 Easymile 자율주행 전기버스 기술 파트너 선정
- 2018. 02. 스웨덴 Zuragon ADAS Testing Tool 관련 계약 체결
- 2017. 12. 서울연구소 (양재 RNCD 혁신 허브) 개소
- 2017. 11. 자율주행 알고리즘 개발 외 1건 국내 특허 출원
- 2017. 10. ㈜소네트 설립 (대표이사: 손준우)
- 2014. 11. DGIST 자율주행자동차 고속주회로 시험 성공
- 2014. 01. DGIST 자율주행 프로젝트 착수

Auto Drive Powered by **sonnet.ai**

임시운행을 허가받으면서 45대의 자율주행차 현황(2018년5월 현재)	
자동차업계	현대차(15), 기아차(2), 쌍용차(1), 아우디(1), 모비스(1), 만도(1)
IT, 통신, 전자	삼성전자(3), KT(2), 네이버랩스(1), LG전자(1), SKT(1), 소네트(1)
연구기관	융합기술연구원(3), 전자통신연구원(2), 교통안전공단(2), 자동차부품연구원(1)
대학교	서울대(4), 한양대(2), KAIST(1)

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Autonomous Car Business Trends

(Source: techcrunch.com)

(Source: www.sfchronicle.com)

Motivation for Autonomous Vehicles

Road Safety

- Accident Prevention
- **More than 90%**
  : Driver Error

Environment

- Eco-Driving
- Fuel Efficiency Difference
  following Driving Habit: **15~40%**

Productivity

- Social Costs Saving Results from
  Traffic Congestion Reduction
- Productive Activity on Driving

Quality of Life

- Life Quality Improvement
- Mobility Improvement for
  Vulnerable Road Users
- Leisure Time on Driving

Social benefits

In-Depth Studies of Accidents

- Driver error is the main reason : 90+% of all crashes

Driver / Vehicle / Road — Interaction

	Percent
Human error	68.1
Human error & Vehicle	3.4
Human error & road	19.2
Road	5.9
Vehicle	2.1
Vehicle & road	0.4
All three elements	0.8

Elvik et al. 1997
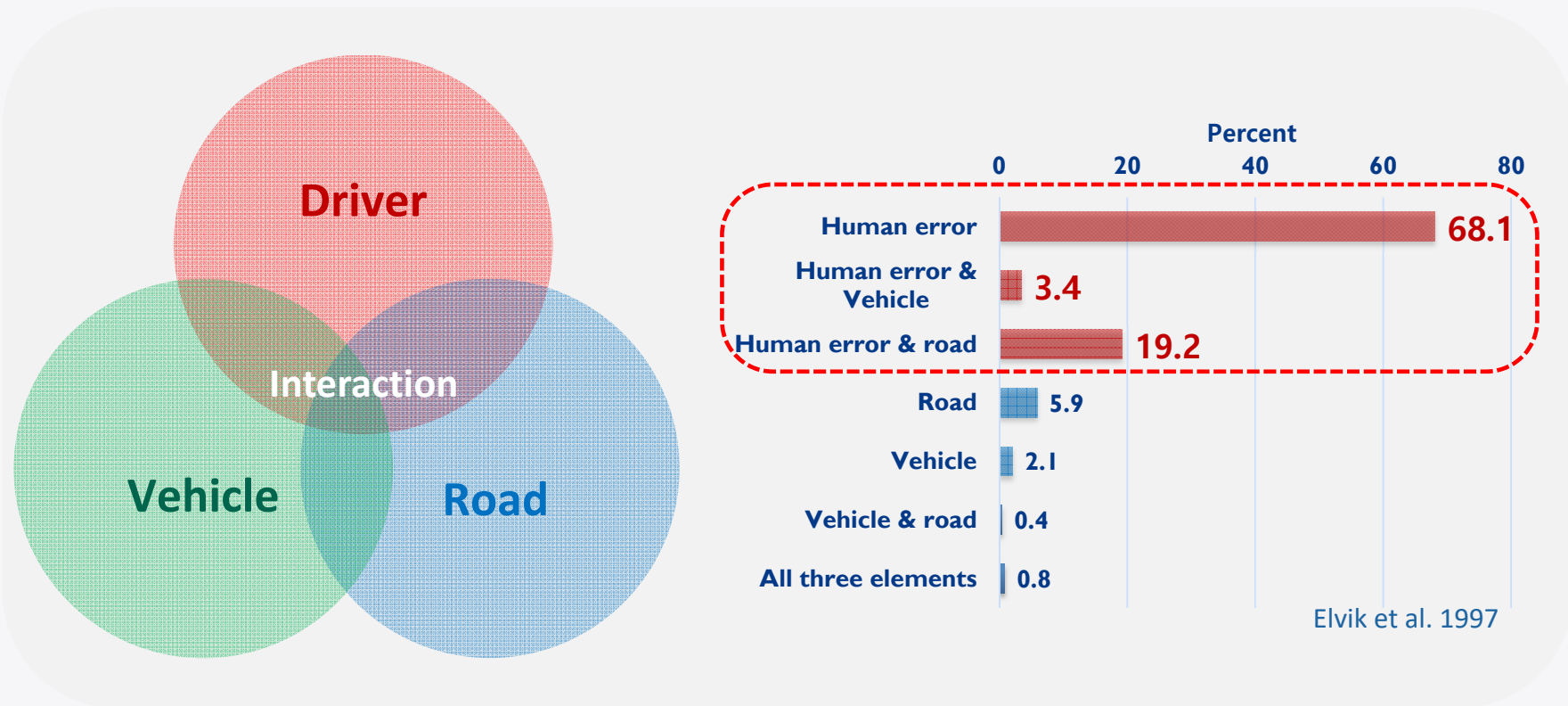
How about Autonomous System Failure in Level 3?

Driver Error 90% of All Crashes

Autonomous Vehicle Decreased Crashes

System Failure Take-Over Request

OOPS
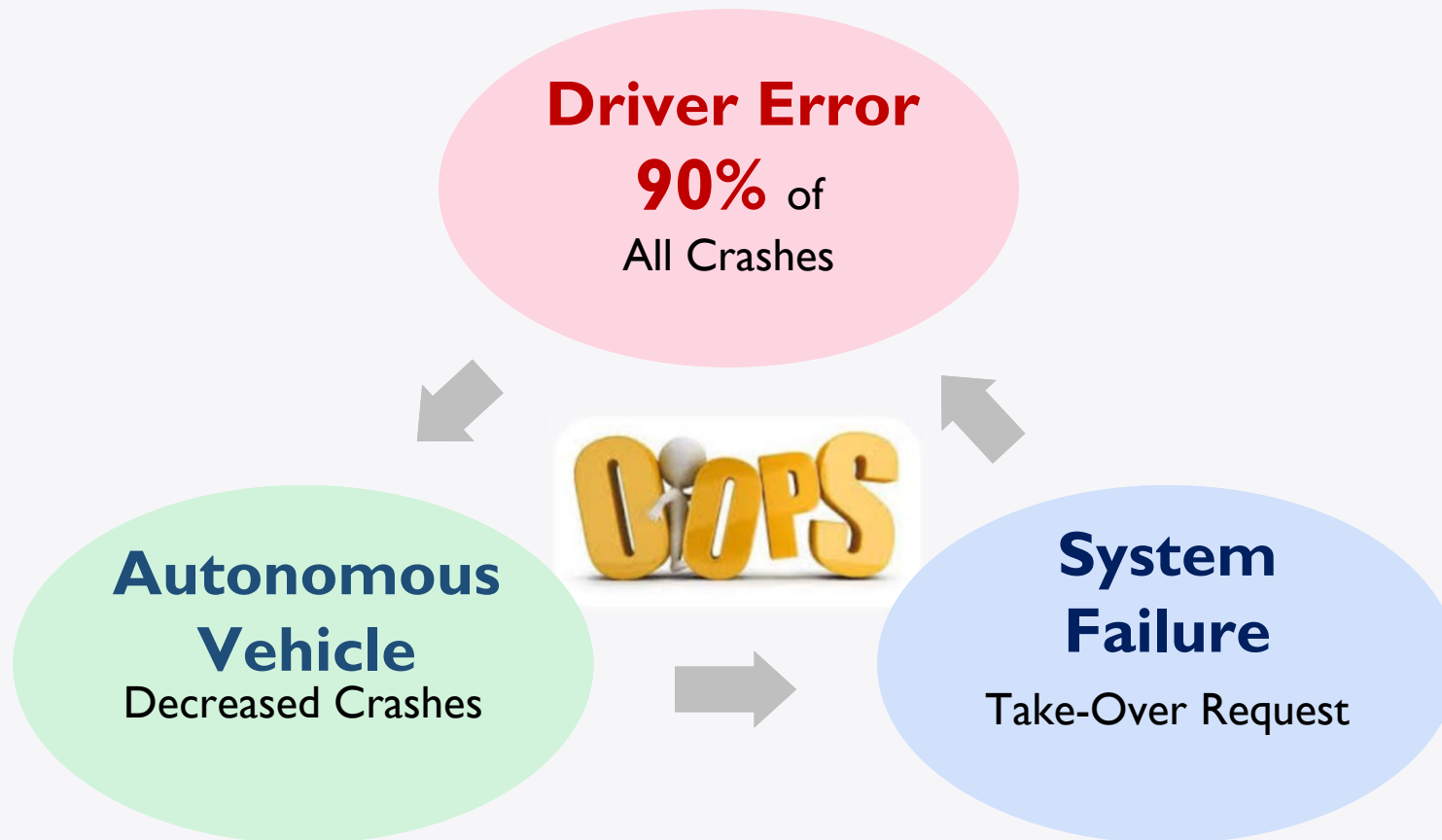
Deadly Crash with Self-Driving Uber

NTSB's preliminary report

- Uber's self-driving car was able to detect Herzberg as she was attempting to cross the road but failed to brake
- The car's radar & LIDAR sensors were able to detect an object in the path of the vehicle about six seconds before the crash, but it misclassified her as an unknown object, then a vehicle, then finally a bicycle
- At 1.3 seconds before impact, the system tried to initiate an emergency braking maneuver, but Uber had deactivated the vehicle's factory-equipped automated emergency braking system to help ensure less erratic testing

SELF-DRIVING UBER HITS & KILLS WOMAN
abc15 ARIZONA

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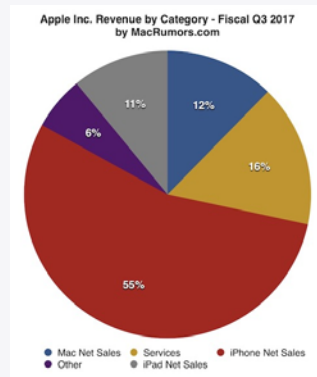sonnet.ai
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Digital Platform Companies

Apple

- IT + Luxury
- 86% of global smart-phone profits ('17 Q4)
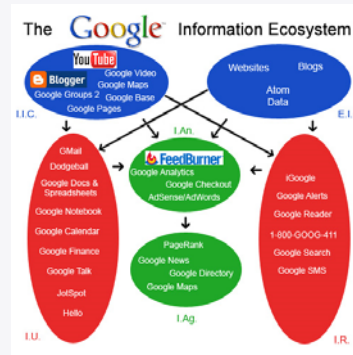- App Store + iTunes

Amazon

- World Largest Store
- Few Offline Stores
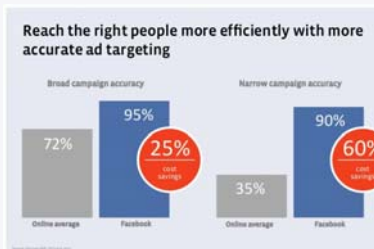- Prime member: One-Day Shipping

Google

- World Largest Information Provider
- Search Engine
- Youtube

Facebook

- World Largest Contents Provider
- Privacy vs. Openness
- Accurate AD targeting

Market Capitalization Ranking 2018

- Largest US companies in 2018 vs 2008

Rank	2018			2008		
	Company	Founded	USbn	Company	Founded	USbn
1	Apple	1976	1,005	Exxon	1870	492
2	Amazon	1994	909	GE	1892	358
3	Google	1998	862	Microsoft	1975	313
4	Microsoft	1975	835	AT&T	1885	238
5	Facebook	2004	524	P&G	1837	226

The Next Platform

- What will be the next disruptive platform?
  - Mobility platform - Uber
  - Home rental platform - Airbnb
  - Healthcare platform?
  - etc.

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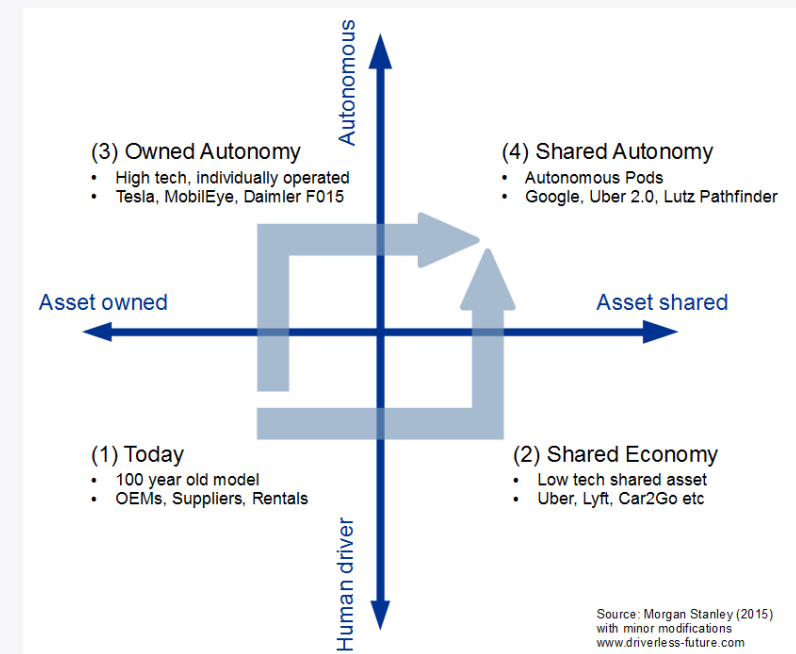# Mobility Platform: Disruptive Innovation (I)

- **Trillions** will depends on **Driverless** or **Human** Drivers
  - US car-related industries : **$2.5 trillion / year**
    - Suppliers, Automakers, Dealers
    - Financing, Insurance, Service, Energy, etc.
  - New Vehicle Sales (U.S) : 19% of Global Sales (2014)
  - If **human drivers** are required, even for **1%** of each trip
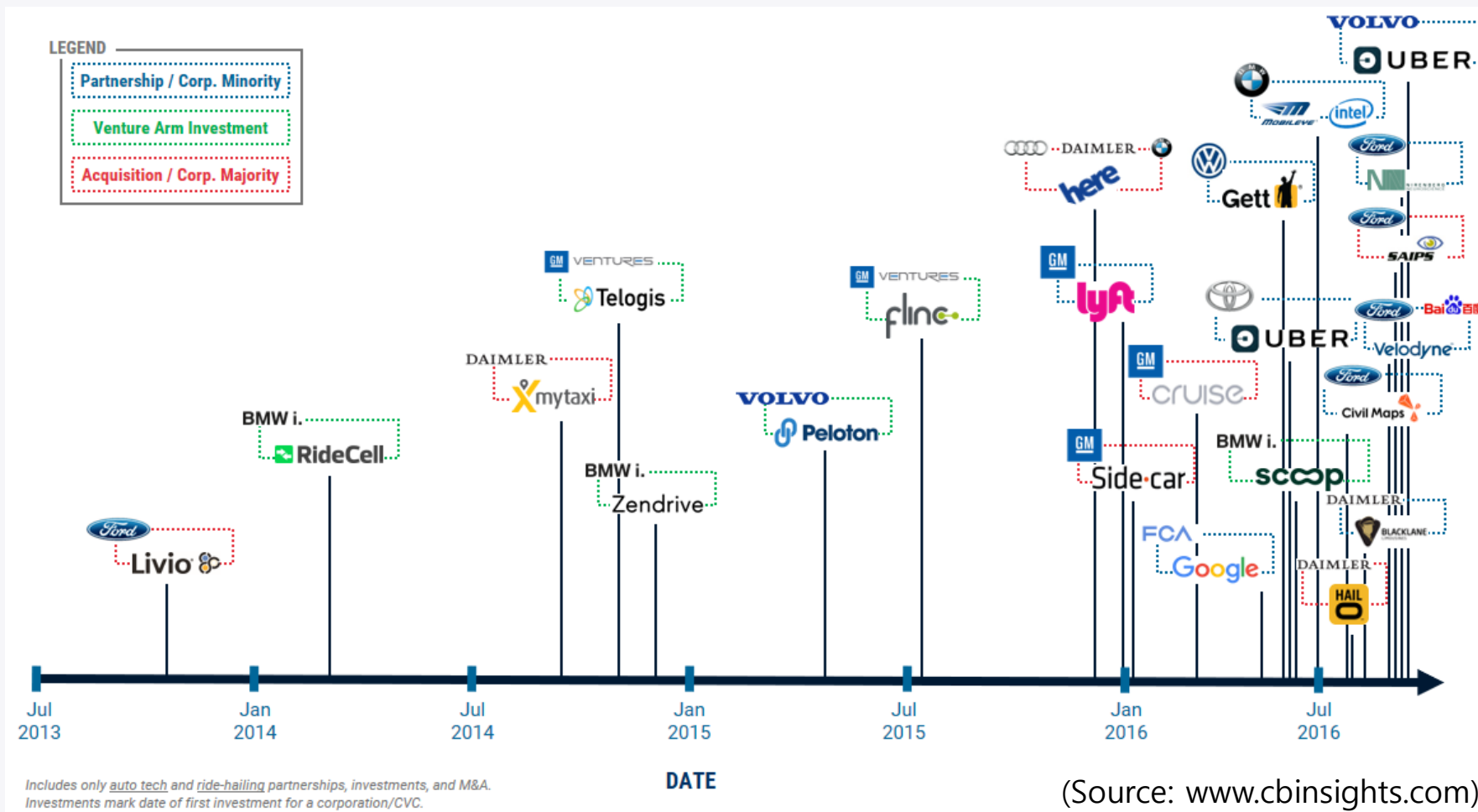   - ➔ Disruptions will be minimal

Ultra (Ultra Light Transit)
London Heathrow Airport
(Since May 2011)

Mobility Platform: Disruptive Innovation (II)

- Scenario of Driverless Taxis
  - 2015 OECD Report "Urban Mobility System Upgrade"
    - Same mobility can be delivered with 10% of the cars
  - Car ownership Impacts
    - Cars are driven just 4% of the time (Morgan Stanley)
    - Average cost of car ownership is nearly $9,000/yr
    - Car sharing service (Uber, Zipcar) → Alternative to car ownership
    - UC-Berkeley study (2011) showed that vehicle ownership among car sharing users was cut in half

Autonomous

(3) Owned Autonomy
- High tech, individually operated
- Tesla, MobilEye, Daimler F015

(4) Shared Autonomy
- Autonomous Pods
- Google, Uber 2.0, Lutz Pathfinder

Asset owned   Asset shared

(1) Today
- 100 year old model
- OEMs, Suppliers, Rentals

(2) Shared Economy
- Low tech shared asset
- Uber, Lyft, Car2Go etc

Human driver

Source: Morgan Stanley (2015)
with minor modifications
www.driverless-future.com

Big Auto's Moves in Auto Tech & Ride-Hailing

(Source: www.cbinsights.com)

California Autonomous Car Permit Holders (Aug. 2018)

Automotive	17	IT	7	Startup	31
Volkswagen	Ford	Subaru	Jingchi	Changan	Gatik AI
Benz	Zoox	Udacity	SAIC	Lyft	DiDi
Waymo	Drive.ai	Navya	Almotive	Phantom AI	TORC Robotics
Delphi	Faraday Future	Renovo.auto	Aurora	Qualcomm	Boxbot
Tesla	Baidu USA	PlusAi	Nullmax	aiPod, Inc.	EasyMile
Bosch	Valeo	Nuro	Samsung	SF Motors	
Nissan	NIO USA	CarOne	Continental	Toyota	
GM Cruise	Telenav	Apple	Voyage	Apex.Al	
BMW	NVIDIA	Pony.AI	CYNGN	Intel	
Honda	AutoX	TuSimple	Roadstar.Ai	Ambarella	

Business Models in the Era of Autonomous Vehicle
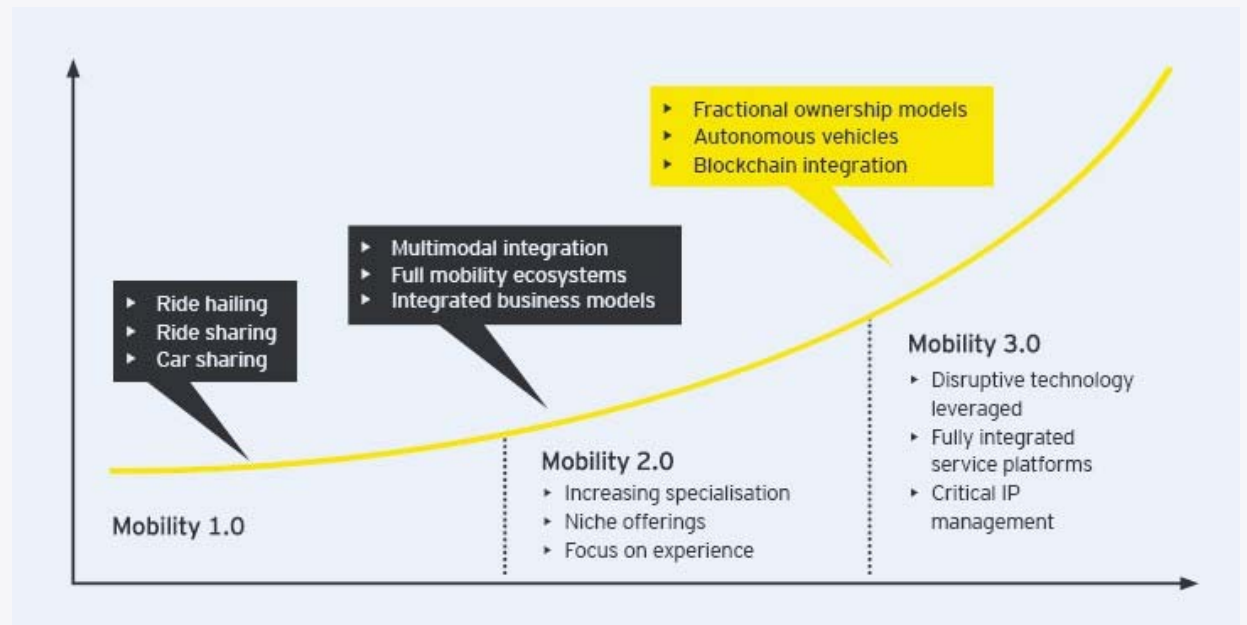
AD Service Platforms

- Mobility Service

- Delivery/Logistic Service

- Data Service

- …

Inventing Your Own Service Using AD Technology

The Mobility Service Revolution

- Future Mobility Service Platform
  - Blockchain enabled Fractional Ownership
  - Autonomous Vehicle

- Preparation for Mobility 3.0
  - Understand the customer
 - Embrace shared mobility
  - Work with Government

- Ride hailing
- Ride sharing
- Car sharing

- Multimodal integration
- Full mobility ecosystems
- Integrated business models

- Fractional ownership models
- Autonomous vehicles
- Blockchain integration

Mobility 1.0

Mobility 2.0
- Increasing specialisation
- Niche offerings
- Focus on experience

Mobility 3.0
- Disruptive technology leveraged
- Fully integrated service platforms
- Critical IP management

(Source: EY, When transport becomes a service, what will car ownership look like?)

Autonomous Vehicle Revolution

Expected Growth Path

- Era 1 : 2015~2020
  - New mobility models begin to emerge
- Era 2 : 2020~2030
  - Consumers begin to adopts AVs
- Era 3 : 2030~2050
  - AVs becomes the primary means of transport
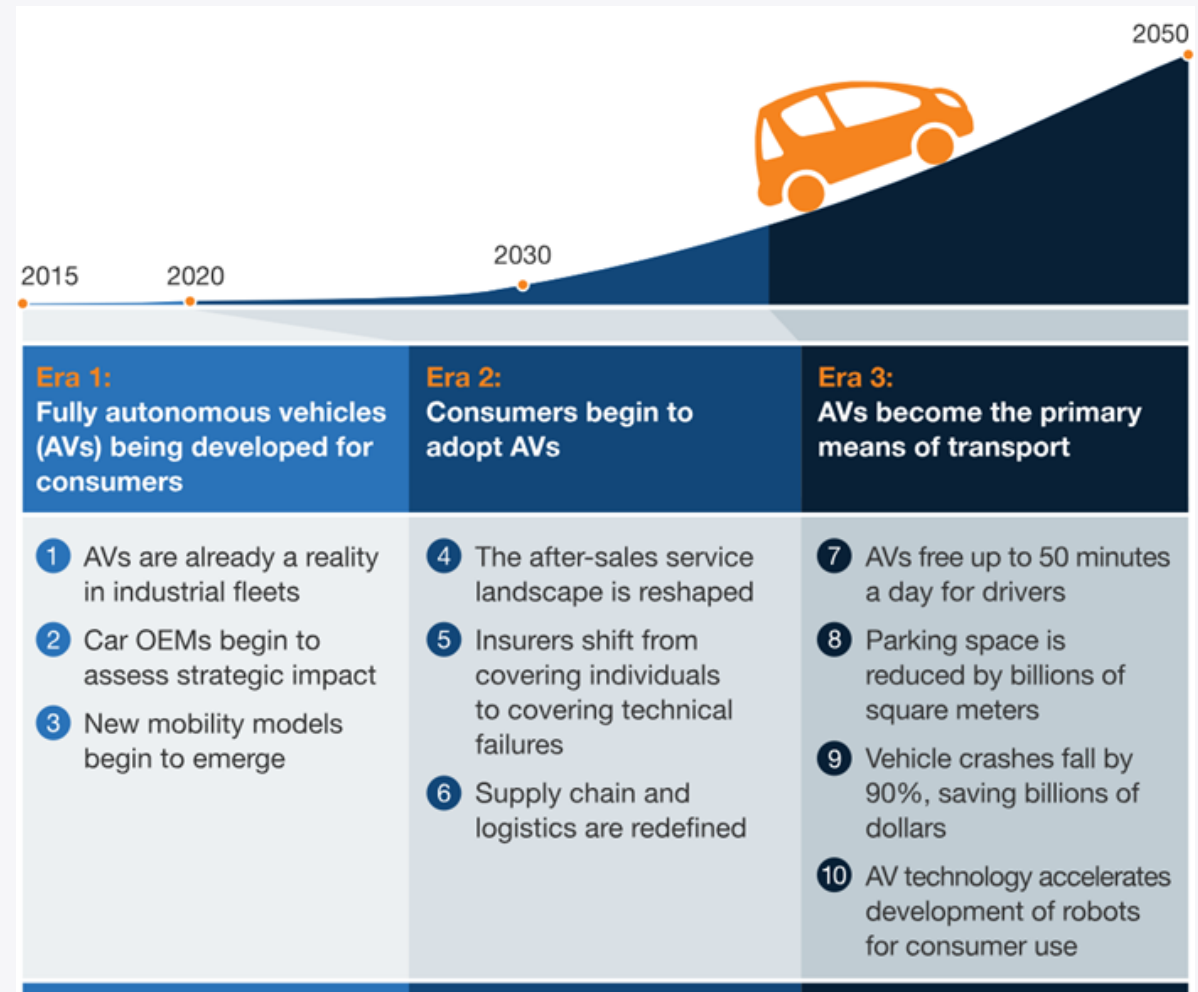
(Source: McKinsey & Co.)

AutoDrive™: Open & Scalable Platform for AD

Concept of AutoDrive : Scalable Platform for Autonomous Driving

- AD Simulation Platform (Model-In-the-Loop)

- AD Emulation Platform (Hardware-In-the-Loop)

- AD Vehicle Platform (Vehicle-In-the-Loop)

AD Simulation Platform
(Model-In-the-Loop Platform)

Software Package

AD Emulation Platform
(Hardware-In-the-Loop Platform)

**Software Package
+ Hardware Kit**

AD Vehicle Platform
(Vehicle-In-the-Loop Platform)

**AD Vehicle Kit
+ Embedded S/W**

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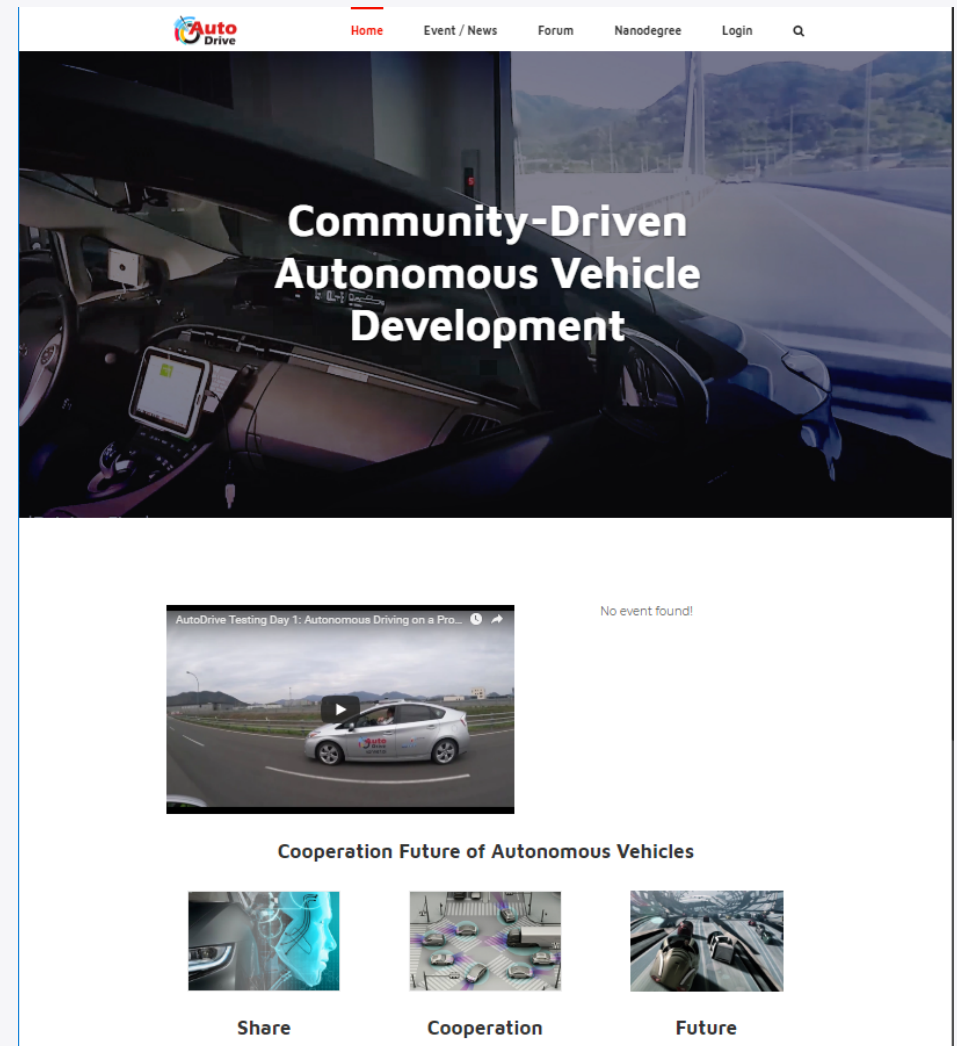
Summary & Proposal

- See autonomous driving at the viewpoint of a service

- Platform thinking for Mobility Services
  → New concept of ownership

- Open & scalable platform for developing & deploying autonomous vehicles

Thank you

Contact: **info@sonnet.ai**
Community: **www.auto-drive.net**