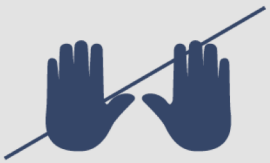
Caso Audi e auto a guida autonoma

1. Sulla base delle informazioni fornite, ragionate sui **fattori** che guideranno la **velocità di diffusione** nel mercato delle automobili a guida autonoma. Quali fattori abilitanti favoriranno la diffusione delle automobili a guida autonoma? Quali saranno le principali barriere alla diffusione? Siete in grado di delineare una **curva a S di diffusione** delle automobili a guida autonoma nel mercato? Siete in grado di tracciare una **curva a S di evoluzione della performance tecnologica** delle automobili a guida autonoma?

2. Quale è il ruolo **della regolamentazione e delle politiche pubbliche** per lo sviluppo e diffusione delle automobili a guida autonoma?

Diversi livelli di guida autonoma

I LIVELLI DI CLASSIFICAZIONE DELL'AUTO A GUIDA AUTONOMA

AUTO TRADIZIONALI	AUTO CONNESSE O SEMI-AUTONOME		AUTO AUTONOME		
LIVELLO 0 GUIDA CLASSICA	**LIVELLO 1 SENZA PIEDI**	**LIVELLO 2 SENZA MANI**	**LIVELLO 3 SENZA OCCHI**	**LIVELLO 4 SENZA TESTA**	**LIVELLO 5 SENZA GUIDATORE**
Nessun sistema di assistenza alla guida oltre all'ABS.	Aiuto attivo come il cruise control o il park-assist. Il conducente gestisce solo la direzione dell'auto.	Aiuti attivi come lane assist e il break emergency assist. Il conducente agisce come controllore e interviene solo in casi di urgenza.	Il conducente può dedicarsi ad altre attività ma deve poter riprendere il volante se necessario.	Solo una persona con patente deve essere presente a bordo.	L'auto può spostarsi da sola, senza la presenza di un conducente.
					

Fonte: SAE International, Automated driving standards

Vantaggi potenziali delle auto a guida autonoma

Motivazione principale:

- Maggiore sicurezza

Altri possibili benefici:

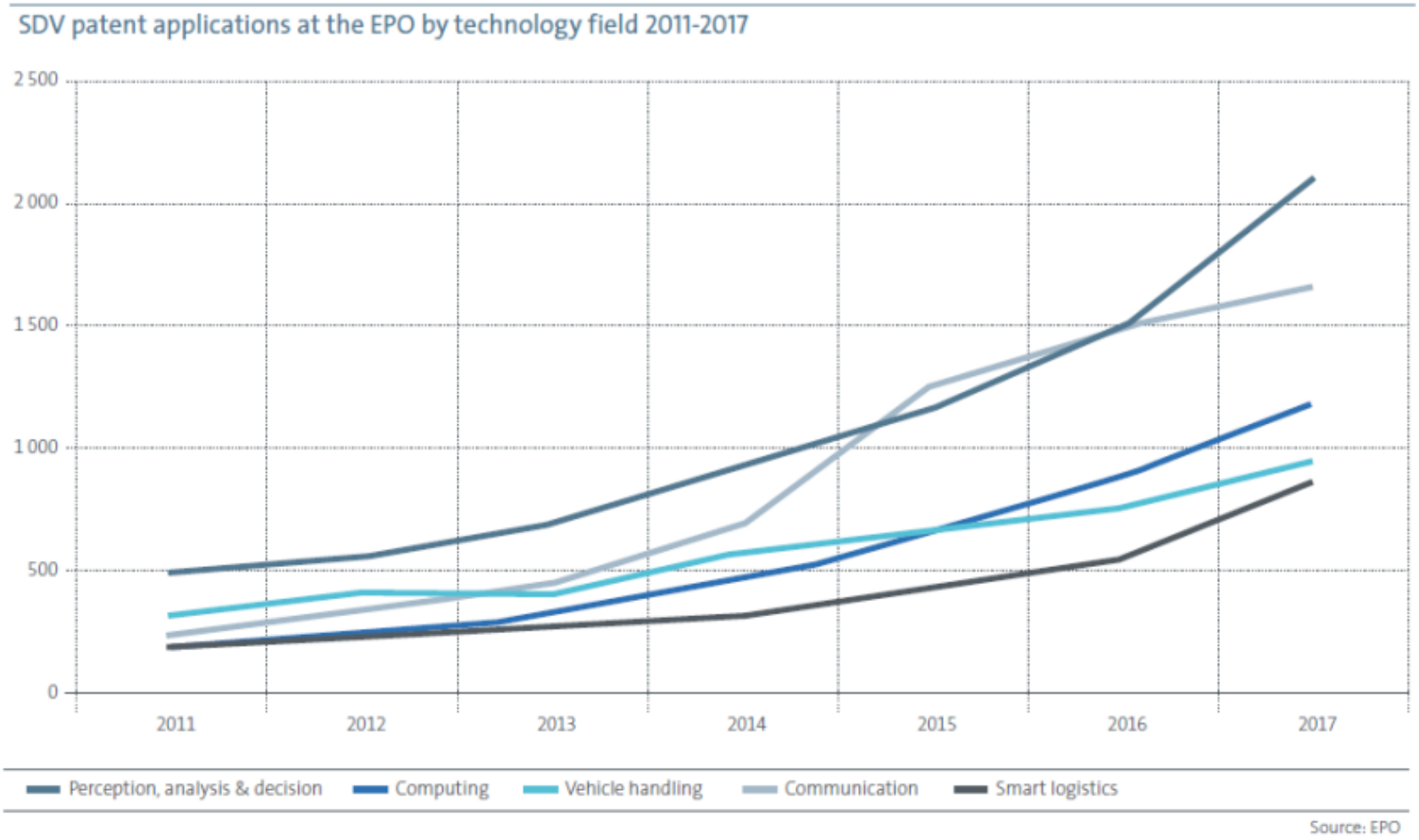
- Migliorare il flusso del traffico
- Ottimizzare i consumi
- Aumentare il comfort dei passeggeri e liberare tempo
- Garantire mobilità a coloro che non possono guidare auto attuali

Dinamiche tecnologiche e di settore

L'evoluzione delle tecnologie a guida autonoma sta seguendo le dinamiche tipiche delle discontinuità tecnologiche:

- Competizione fra soluzioni tecnologiche alternative
- Fase iniziale di fermento, con entrata di numerose startup
- Entrata di numerosi concorrenti da settori contigui (tech player)
- Forte aumento della brevettazione
- Rapida evoluzione delle regolamentazioni

Trend brevettuali



Fonte: EuropeanPatent Office Report 2018

Principali gruppi brevettati

Main applicant groups for SDV patent applications at the EPO and their technology profiles 2011-2017

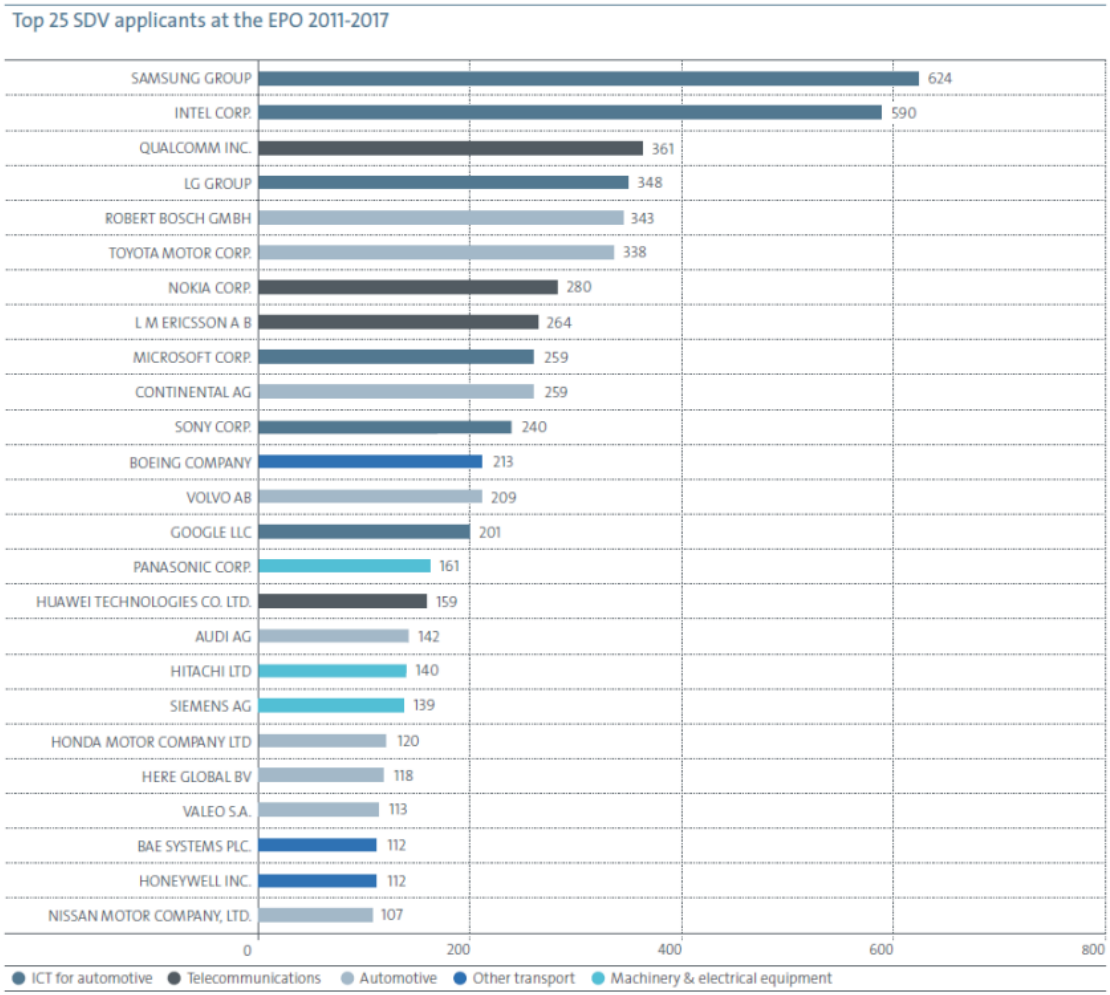
	Automotive	Other transport	Machinery & electrical equipment	Telecom	ICT for automotive	Other
Perception, analysis & decision	44.4%	9.9%	13.6%	4.2%	23.8%	4.2%
Computing	33.6%	7.6%	14.4%	9.1%	30.4%	4.9%
Vehicle handling	63.4%	4.6%	15.8%	2.2%	10.8%	3.3%
Communication	18.5%	3.6%	6.9%	25.1%	42.6%	3.3%
Smart logistics	48.7%	7.0%	19.6%	5.1%	15.4%	4.1%

Source: EPO

The patent statistics in this table are based on patent applications filed at the EPO in SDV technologies. They do not include patent applications filed with the national offices of the EPC contracting states. The reference date for each application is the filing date at the EPO.

Fonte: EuropeanPatent Office Report 2018

Le imprese top patenter



Fonte: EuropeanPatent Office Report 2018

Esempi di tecnologie per auto a guida autonoma

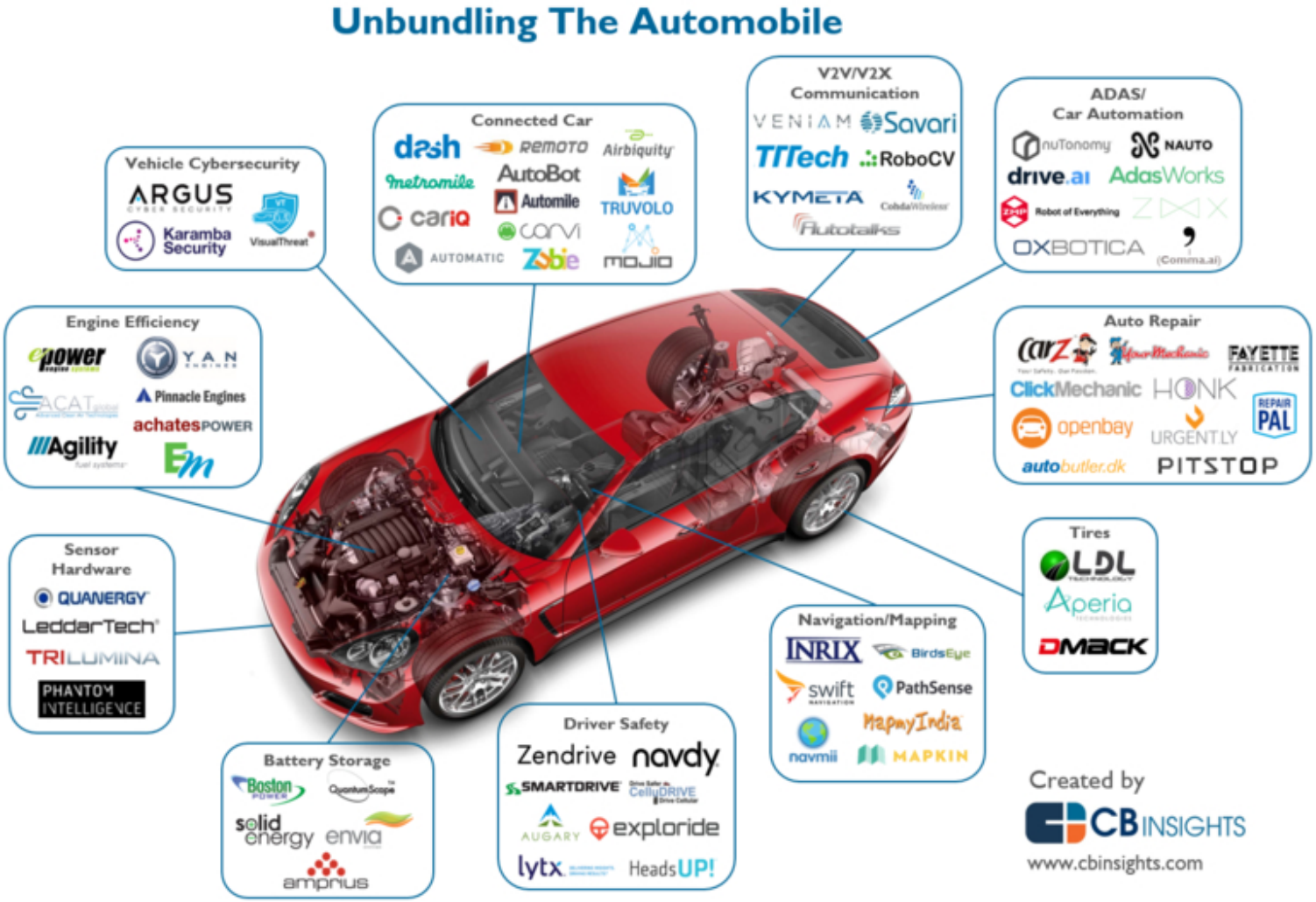
Table 2.1

Cartography of SDV inventions

Sectors	Technology fields	Examples of technologies included
Automated vehicle platform	**Perception, analysis & decision**	– Short-, medium-, long-range radar for adaptive cruise control – Cameras for lane departure warning/control, traffic sign recognition, surround view – Navigation and mapping systems – Adaptive cruise control (ACC) and platooning – Scene perception and modelling – Vehicle stability, dynamic chassis control, conjoint control of stability systems
	Computing	– Bus systems – Supervisory systems for fault recognition and recovery – Artificial intelligence – Computer security – Diagnostics and fault management
	Vehicle handling	– Automatic steering – Vehicle suspension control – Control systems for road vehicle drive control – Powertrains: battery electric vehicles (BEV); hybrid vehicles; efficient internal combustion engine vehicles
Smart environment	**Communication**	– 5G network – MM wave antenna arrays technology – Cloud for learning and updating high-definition maps and traffic data – Cellular communication systems for vehicle applications – Traffic signal arrangements – Road embedded sensors and signalling – Connection management for emergency connections (eCall)
	Smart logistics	– Fleet management – Traffic control systems for road vehicles – Automated parking – Inductive on-road recharging systems – Smart grids in transport

Fonte: EuropeanPatent Office Report 2018

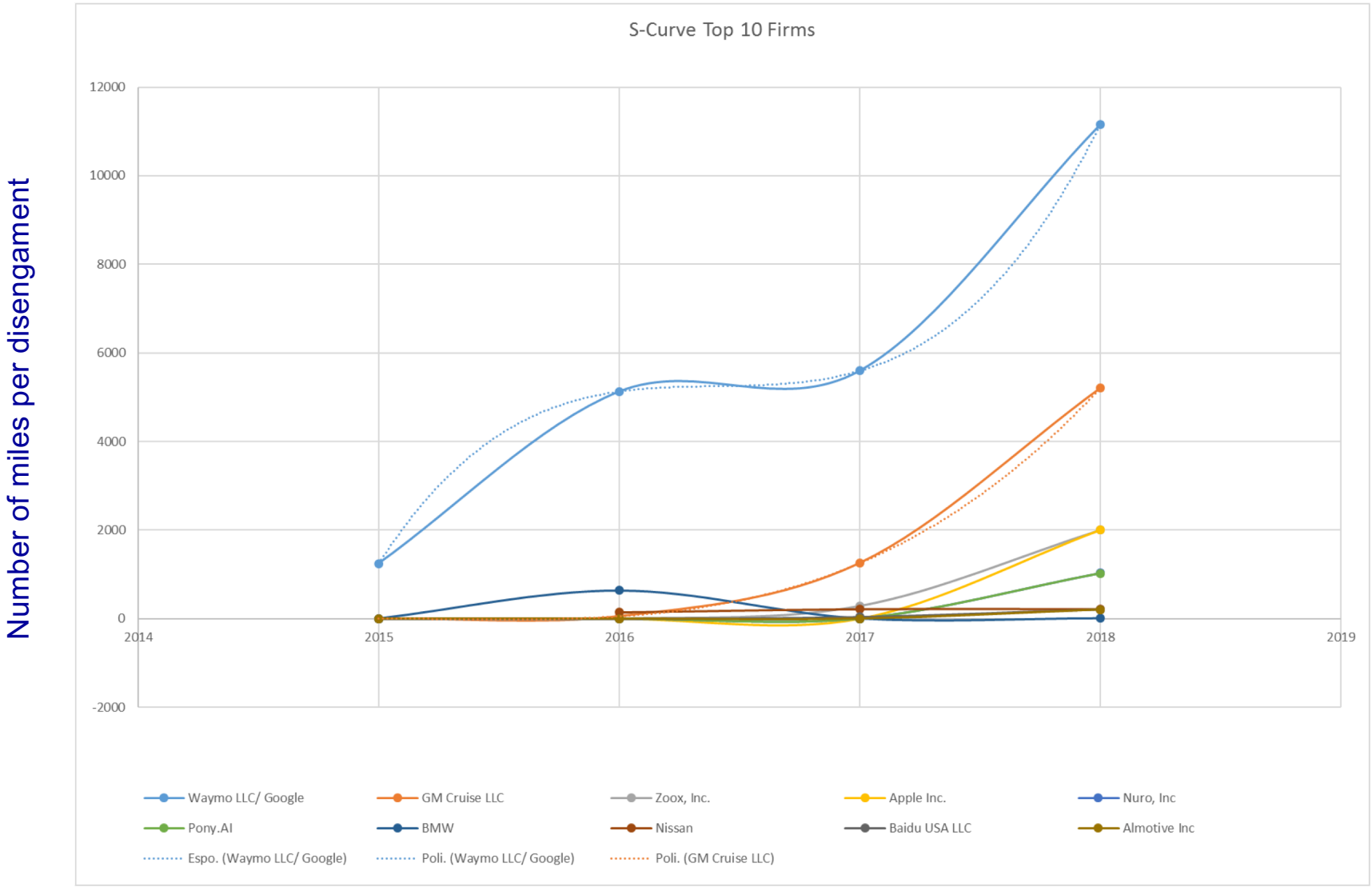
Nuove startup entranti nel settore automotive



Diffusione delle auto a guida autonoma

- Miglioramento nelle performance delle tecnologie, in particolare software
- Affermazione di standard condivisi
- Adeguamento e adattamento delle infrastrutture
- Accettazione da parte dei consumatori rispetto ai benefici/costi
- Affermazioni di legislazioni e regolamentazioni favorevoli
- Cybersecurity
- Problematiche legate a *data ownership* e *privacy*
- Problematiche assicurative
- Questioni etiche

Evoluzione della performance delle auto a guida autonoma in California



“How safe are driverless cars? It’s too soon to tell”

“**Self-driving cars have claimed their first pedestrian fatality, a woman in Tempe, Ariz.,** who was struck and killed by an Uber vehicle traveling in autonomous mode. **Weren’t self-driving cars supposed to be safer than those piloted by fallible humans?**

And who says they aren’t? As many on social media rushed to point out, more than 37,000 people were killed by human-piloted vehicles in 2016. Compared with that, one pedestrian fatality, however sad, looks pretty good.

This argument is appealing. Unfortunately, it’s wrong.

Motor vehicle fatalities are measured in terms of “**vehicle miles traveled**,” which is just what it sounds like. In 2016, there were **1.18 fatalities for every 100 million miles** that Americans drove. Since Americans drove nearly 3.2 trillion miles that year, that still added up to tens of thousands of deaths.

To know whether self-driving cars are safer than the traditional kind, you’d have to know how many miles they traveled before incurring this first fatality. **And the answer is “fewer than 100 million” — a lot fewer**. Waymo, the industry leader, recently reported logging its 4 millionth mile of road travel, with much of that in Western states that offer unusually favorable driving conditions. Uber just reached 2 million miles with its autonomous program. Other companies are working on fully autonomous systems, but adding them all together couldn’t get us anywhere close to 100 million. (The numbers go up if you add Tesla’s autopilot, but that system has more limited capabilities, and fatality statistics don’t necessarily get any clearer — or more favorable — if you do.)

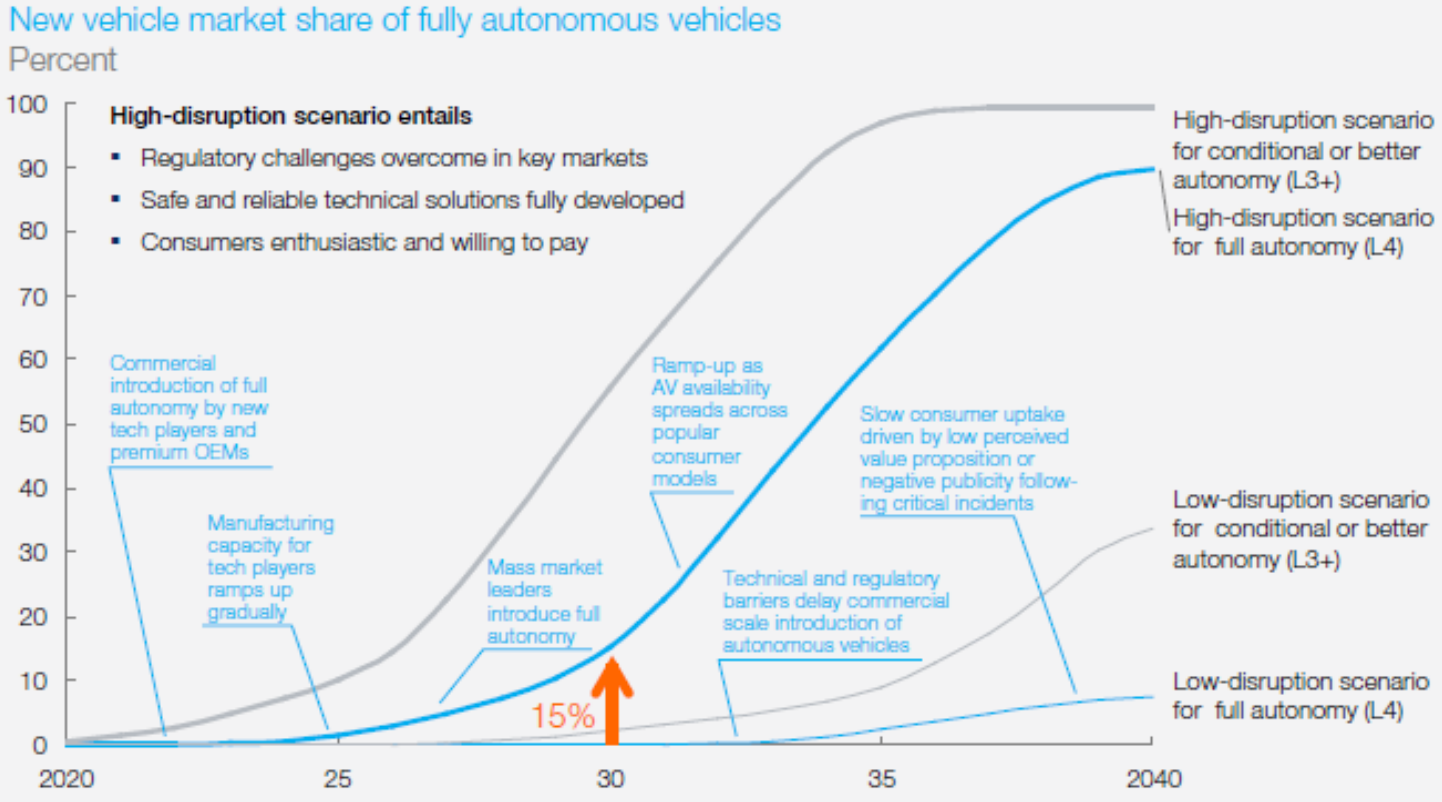
Which is not to say that we should pull the plug on autonomous driving. For one thing, regular old-fashioned cars were none too safe when they first arrived on American roads. In **1921, the first year for which such data is available, there were 24 deaths for every 100 million vehicle miles traveled**. Over time, improved cars, drivers and roads reduced that figure by nearly 95 percent. Presumably, self-driving cars can also improve.”

Fonte: Whashington Post, 21 marzo 2018

Curve a S di diffusione nel mercato dell'auto autonoma

Exhibit 6

Subject to progress on the technical, infrastructure, and regulatory challenges, up to 15% of all new vehicles sold in 2030 could be fully autonomous



SOURCE: McKinsey

Curve a S di diffusione nel mercato dell'auto autonoma

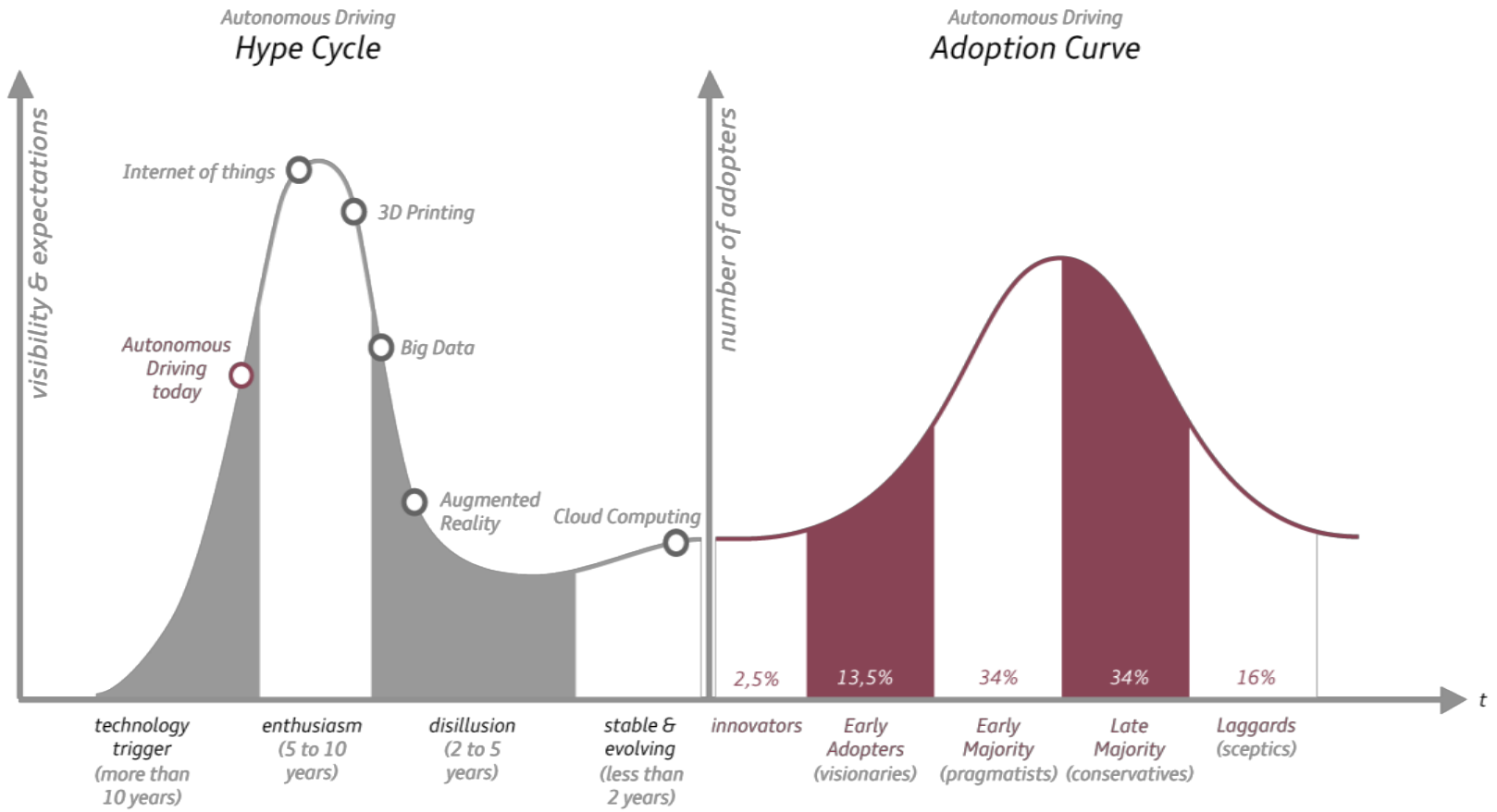


Figure 2: The Innovation Path of Autonomous Driving

Fonte: Bartl 2015